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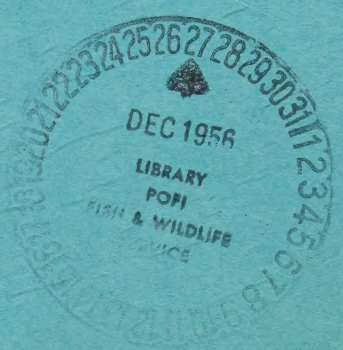
INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

Established by Convention between Canada, Japan and the United States for the Conservation of the Fisheries Resources of the North Pacific Ocean



ANNUAL REPORT

FOR THE YEAR

1955

VANCOUVER, CANADA

1956

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

MEMBERS - - 1955

CANADA

Stewart Bates (to Feb. 1, 1955)
George R. Clark (from Feb. 1, 1955)
John M. Buchanan
James Cameron
Roger T. Hager

UNITED STATES

Milton E. Brooding
Edward W. Allen
John H. Clawson (from April 6, 1955)
John L. Farley
B. Frank Heinztleman (to April 6, 1955)

JAPAN

Iwao Fujita
Koh Chiba (from April 5, 1955)
Masao Okai (from Oct. 21, 1955)
Kenkichi Nakabe (from Oct. 17, 1955)
Koichiro Kobayashi (to Oct. 17, 1955)
Shigeo Maetani (to Oct. 21, 1955)
Tadashi Kiyoi (to Feb. 1, 1955)
Ryuji Takeuchi (to April 5, 1955)

SECRETARIAT

Milton C. James, Executive Director (to June 10, 1955)
Roy I. Jackson, Executive Director (from July 15, 1955)
Hiroshi Kasahara, Assistant Director

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

Established by Convention between Canada, Japan
and the United States for the Conservation of the
Fisheries Resources of the North Pacific Ocean

ANNUAL REPORT

FOR THE YEAR

1955

209 Wesbrook Building
University of British Columbia
Vancouver 8, B. C., Canada

LETTER OF TRANSMITTAL

The Chairman of the International North Pacific Fisheries Commission presents his compliments to the Contracting Parties and their Commissioners and has the honor to transmit herewith an Annual Report relating the Commission's activities during the calendar year 1955. The Report is presented in compliance with Article III, Section (1) paragraph (f) of the International Convention for the High Seas Fisheries of the North Pacific Ocean and Rule 14 (f) of the Rules of Procedure.

EDWARD W. ALLEN,
Chairman.

FOREWORD

The International North Pacific Fisheries Commission was established under the International Convention for the High Seas Fisheries of the North Pacific Ocean, which came into effect upon exchange of ratifications between the Contracting Parties—Canada, Japan and the United States—on June 12, 1953. The Commission held its organizational meeting in Washington, D.C., beginning on February 1, 1954. Its first Annual Meeting was convened in Vancouver, Canada on October 25, 1954. In compliance with Article III (1) (f) of the Convention and Rule 14 (f) of the Rules of Procedure, a report of each of these meetings was prepared and distributed.

The report which follows contains a summary of action by the Commission at its 1955 Annual Meeting, which began on October 31 in Tokyo, a summary of administrative activities for the year and progress reports on research conducted by the member governments under the Commission's program. The program of investigations, as adopted at the 1954 Annual Meeting, was initially undertaken in 1955. Research agencies of each of the three countries carry out portions of the Commission's program. Co-ordination and interpretation of research findings and development of recommendations to the Contracting Parties are responsibilities of the Commission itself.

The 1955 Annual Report thus contains summaries of research carried out for the Commission by the research agencies of the three nations. The summaries were prepared several months after the Annual Meeting had adjourned. The views contained in these summaries are those of the authors and do not necessarily represent the views of the Commission, since it has not yet had an opportunity to give them full consideration. Only preliminary material was presented to the Commission at its 1955 Annual Meeting. Analysis of data from 1955 investigations was far from complete at the end of that year.

The research program undertaken by the Commission is at present concentrated on determining the continental origin of stocks of salmon on the high seas and on determining whether there is a need for joint conservation measures for the king crab stock of the eastern Bering Sea. Outstanding progress was made on all portions of these difficult problems during 1955 and plans for 1956 are being expanded. It is believed that the Commission's investigations represent the largest co-ordinated and unified fisheries research program ever to be undertaken.

ROY I. JACKSON,

Executive Director.

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I. Report of the 1955 Annual Meeting

October 31 - November 5, 1955

1. Time and Place of Meeting.

The Second Annual Meeting of the International North Pacific Fisheries Commission was held in Tokyo, Japan from October thirty-first to November fifth, Nineteen Hundred and Fifty-five. The opening plenary session, to which the public was invited, was convened in the Conference Room of the Tokyo Grand Hotel. Subsequent meetings were held in the Conference Suite of the building of the Ministry of Agriculture and Forestry. The Conference Suite was made available to the Commission as a courtesy from the Government of Japan. Two plenary sessions were held on October thirty-first and additional sessions were held on November first, second, fourth and fifth.

The Plenary meetings of the Commission were preceded by meetings of the Standing Committee on Biology and Research, extending throughout the week beginning October twenty-fourth. Meetings of this Committee and of the Standing Committee on Finance and Administration were also held during the intervals between plenary sessions.

2. Participants.

All members of the Commission from the three member countries, Canada, Japan and the United States, attended the Meeting. They were accompanied by advisers and, in the case of the delegations from Japan and the United States, by members of their Advisory Committees. An observer was present from the Food and Agriculture Organization of the United Nations. A list of all participants and membership of the Standing Committees is given in Appendix I of this report.

3. Opening Session.

The Chairman, Mr. Iwao Fujita of Japan, opened the meeting and welcomed the guests and participants. The Honorable Ichiro Kono, Minister of Agriculture and Forestry, welcomed the delegations on behalf of the Japanese government. The Minister stressed his country's dependence on the resources of the sea and gave assurance of Japan's unstinting efforts, in co-operation with Canada and the United States, toward further development and adequate conservation measures for the fisheries of the North Pacific Ocean. Mr. Kono referred with pleasure to the enhancement of mutual understanding between the three participating nations, which arose from these meetings.

Mr. Kenkichi Nakabe, speaking on behalf of the Japanese Delegation, extended greetings to the visiting delegates. Mr. Nakabe expressed gratification that the three nations, guided by the spirit of scientific co-operation, were making the utmost effort to fully utilize and effectively conserve the fisheries resources of the North Pacific.

Mr. George R. Clark, as spokesman for the delegation from Canada, thanked the Honorable Mr. Kono and Mr. Nakabe for their addresses of welcome. Mr. Clark referred to the belief held by Canadians that the Commission had a most important task to perform and expressed confidence that it would succeed in achieving the development and conservation of the North Pacific fisheries on a scientific and co-operative basis.

Mr. Milton E. Brooding, speaking for the United States delegation, responded to the welcome extended by the Minister, the Chairman and Mr. Nakabe. Mr. Brooding voiced gratitude for progress in international understanding and in co-operative research under the Commission's program. He expressed the concern felt by the United States Delegation over the extremely poor catch of salmon by United States fishermen during 1955 and the apparent loss of salmon of North American origin in the open sea.

The Chairman declared the opening meeting adjourned, after determining that attendance at further sessions would be limited to Commissioners and other accredited participants.

4. The Agenda.

The second plenary session was convened in the afternoon of October 31 in the Conference Suite of the Ministry of Agriculture and Forestry Building, where all subsequent sessions were held. The provisional agenda, which had previously been circulated to the various national sections, was adopted as prepared. The agenda is appended to this report as Appendix II.

5. Procedures of the Meeting.

It was agreed that three forms of meeting might be held, in accordance with past practice. These were: (1) open or public meetings, (2) regular meetings, having attendance restricted to Commissioners and other accredited participants, and (3) executive or *in camera* sessions, with attendance restricted to Commissioners, which might be held at the discretion of the Chairman. All meetings except the opening session fell into the second category, no *in camera* meetings being held.

The Chairman was made responsible for issuance of press releases. At his request each national section named a Commissioner as member of a committee with whom the Chairman might consult on important phases of press releases. It was understood that in future years a suggestion for establishing a committee to handle press relations would be adopted.

6. Consideration of Administrative Matters.

a. Reports of the Chairman and Secretary.

The Chairman submitted the *Report of the First Annual Meeting,* October 25 to 29, 1954, as his report to the present meeting. This report was accepted by the Commission. At the request of Mr. George R. Clark of Canada, the *Report of the First Annual Meeting* was also accepted as the Secretary's report to the present meeting. The Secretary also reported on letters of notification recently received from the Japanese National Section to the effect that Mr. Koichiro Kobayashi has resigned as a member of the Commission and had been succeeded by Mr. Kenkichi Nakabe on October 17, 1955, and that Mr. Shigeo Maetani had resigned as a Commission member and had been succeeded by Mr. Masao Okai, effective October 21, 1955. (A list of all members of the Commission during 1955 is given on the inside front cover of this Annual Report.)

b. Report of the Executive Director.

The Commission accepted the report submitted by the Executive Director with regard to administrative matters. This report has been augmented and summarized for publication and appears as Part II of the Annual Report of the Commission for 1955. The information and recommendations contained in the Director's report were dealt with by the Commission after study and recommendations by the appropriate standing committees.

c. Report of the Committee on Finance and Administration.

The Standing Committee on Finance and Administration met on a number of occasions during the course of the Annual Meeting. The Committee consists of one commissioner and one adviser from each national section, with the Director and Assistant Director as *ex officio* members. The Committee reviewed various questions which had been referred to it by the Commission and submitted a report which made recommendations to the Commission involving the accounts and auditor's report for the previous fiscal year, amendments of the Rules of Procedure and the Financial Regulations, establishment of a Working Capital Fund, the budget for 1956-57 and other administrative matters. The following is a summary of the Committee's recommendations, as adopted by the Commission.

i. The Committee recommended approval of the accounts and the auditor's report for the fiscal year ended June 30, 1955. These documents, which show the expenditure of $26,036.63 (Canadian Funds) for headquarters operation during the fiscal period, are appended to the Administrative Report, which forms Part II of this Annual Report.

ii. The Committee recommended several changes in the Rules of Procedure and Financial Regulations in order to improve administrative efficiency. For convenient reference, copies of the Rules and the Regulations, as amended, are appended to the Chairman's Report as Appendices III and IV. The changes affect Rule of Procedure 18 and Sections III, IV, V and VI of the Financial Regulations.

iii. The Committee recommended the establishment of a Working Capital Fund in the initial amount of $5,864.75 (Canadian Funds). The resolution to establish the Fund, its purposes and the amendments necessary to establish it are set out in the appended Financial Regulations. (Appendix IV.)

iv. The Committee recommended that the Executive Director should establish the practice of paying staff salaries within the

budget limits established in United States dollars rather than in equivalent numbers of Canadian dollars.

v. The Committee recommended that each National Section should take steps to determine by the next Annual Meeting whether it would be possible to have annual contributions for administrative expenses made in the currency of the country in which the headquarters is located, rather than in United States currency, as is now the case.

vi. The Committee recommended that budget estimates for the two following financial years be submitted at each future Annual Meeting. The budget estimate for the earlier of the two following financial years is to be considered and adopted by the Commission in the usual way. The budget estimate for the later fiscal year is to be considered and noted by the Commission and to be available to the National Sections for their guidance prior to the convening of the following Annual Meeting, but is not to be adopted until the following Annual Meeting.

vii. The Committee recommended the adoption of several principles to guide the Secretariat in the preparation, distribution and translation of publications for the Commission.

viii. The Committee recorded its appreciation of a report dealing with staff functions and operations prepared by Mr. Milton C. James, the former Executive Director.

ix. The Committee recommended to the Commission the following budget for operation of its headquarters during the fiscal year beginning July 1, 1956:

1. Personal Services	$ 23,130
2. Travel	6,500
3. Transportation of Things	100
4. Communications	800
5. Rents and Utilities	1,530
6. Other Contractual Services	3,000
7. Supplies	800
8. Equipment	1,800
9. Annual Meeting	850
TOTAL (United States Funds)	$ 38,510

7. Consideration of the Reports of the Standing Committee on Biology and Research.

The Standing Committee on Biology and Research met during the week preceding the Annual Meeting and at intervals between plenary sessions. The membership of the Committee consists of one Commissioner and two experts from each National Section; the Executive Director and Assistant Director are *ex officio* members; current membership is given in Appendix I of this report. The Committee submitted two reports, which were adopted by the Commission and are printed in their entirety as Appendix V of this report.

In summary, the Committee determined that each member country had made substantial progress in its part of the Commission's program of research as adopted in 1954 and undertaken for the first time in 1955. At the time of this Annual Meeting it had not been possible to carry out much analysis of data, since field work had only recently been completed. (Note: Summaries of research were submitted by each member country several months after the close of the Annual Meeting. These summaries appear as Part III of this Annual Report.)

The research program at present is largely concentrated on the question assigned to the Commission by the Protocol to the Convention. The second and third paragraphs of the Protocol are quoted here in their entirety in order to clearly define this major responsibility of the Commission.

> "The Governments of the United States of America, Canada and Japan agree that the line of meridian 175° West Longitude and the line following the meridian passing through the western extremity of Atka Island, which have been adopted for determining the areas in which the exploitation of salmon is abstained or the conservation measures for salmon continue to be enforced in accordance with the provisions of the Annex to this Convention, shall be considered as provisional lines which shall continue in effect subject to confirmation or readjustment in accordance with the procedure mentioned below.
>
> "The Commission to be established under the Convention shall, as expeditiously as practicable, investigate the waters of the Convention area to determine if there are areas in which salmon originating in the rivers of Canada and of the United States

> of America intermingle with salmon originating in the rivers of Asia. If such areas are found the Commission shall conduct suitable studies to determine a line or lines which best divide salmon of Asiatic origin and salmon of Canadian and United States of America origin, from which certain Contracting Parties have agreed to abstain in accordance with the provisions of Article V, Section 2, and whether it can be shown beyond a reasonable doubt that this line or lines more equitably divide such salmon than the provisional lines specified in sections 1 (c) and 2 of the Annex. In accordance with these determinations the Commission shall recommend that such provisional lines be confirmed or that they be changed in accordance with these results, giving due consideration to adjustments required to simplify administration."

The research program is also concerned with determining whether there is a need for joint conservation measures for the king crab fisheries of the eastern Bering Sea, at present exploited by the United States and Japan.

Statistics of the principal fisheries of joint interest in the Convention area are being collected and compiled in standardized form to form a basis for other scientific investigations.

The program of research approved by the Commission for 1956 is essentially an extension and enlargement of the plan adopted in 1954 and undertaken initially in 1955. The plan of investigations is given in the published *Report of First Annual Meeting* of the Commission. Research is carried out by agencies of the three participating governments, the Commission being responsible for the development of the program of research, its co-ordination and execution and the interpretation and application of its results.

8. Implementation of the Provisions of the Convention.

The Commission reviewed progress in fulfilling the various responsibilities assigned to it by the Convention. Particular attention was given to the evaluation of progress on the problem assigned to the Commission in the Protocol to the Convention. The reports of the Committee on Biology and Research and the summary reports of research by Canada, Japan and the United States, all of which are included in this Annual Report, related principally to the Protocol question of defining the distribution and origin of high seas salmon populations. The vast area of the North Pacific Ocean in which salmon are found and the unique scientific problem of determination of continent of origin and area of mixing, involving annual fluctuations of salmon abundance by species, by continental origin, and in response to environmental factors, will require research on an unprecedented scale for a considerable period of time. Nevertheless, information presented at the Commission's meeting made it clear that an excellent and broad-scale beginning had been made and that no line of attack has been overlooked. An expanded fleet of research vessels will apply improved techniques of investigation to the problem in 1956.

The Commission gave careful consideration to the establishment of procedures for fufilling other requirements of various articles of the Convention. In relation to Article III (1) (a), which refers to the continuation of the qualifications for abstention, the following resolution was adopted:

> "In order to enable this Commission to carry out its responsibility for determining whether stocks of fish specified in the Annex continue to qualify for abstention pursuant to Article III of the Convention, the following procedure is proposed: the Commission should request each Contracting Party which is managing, or participating in the management of, an abstained stock of fish, to submit to the Commission at the 1956 Annual Meeting, a report, with supporting data, concerning the management of such stock of fish, giving attention particularly to the requirements for abstention. The Commission would then have the opportunity of studying these reports and data and request and receive any needed supplementary data at the 1957 Annual Meeting, following which it would study the entire body of information in time to make its determination at its first Annual Meeting following the fifth anniversary of this Convention in 1958."

Article III (1) (c) subsection (iii) of the Convention deals with the submission of reports on conservation measures by Contracting Parties exploiting stocks of fish which another Contracting Party or Parties have agreed to abstain from fishing. The Commission adopted the following resolution to clarify procedure for handling such reports:

> "The Commission, in accordance with Article III (1) (c), subsection (iii), obtain from the Contracting Party or Parties the reports specified in Article III (1) (c) (iii). The reports already submitted for 1953 and 1954 and future ones are to be transmitted to the Contracting Party or Parties by the Executive Director. Such reports are to be submitted to the Commission and referred by the Commission to the Standing Committee on Biology and Research for study and report to the Commission as to the form and nature of the information submitted."

The Commission, at its third and fourth plenary sessions, considered the various additional provisions of Article III of the Convention in detail and reached agreement on procedure relating to each section of the Article.

A resolution, general in its application, was adopted in order to clarify the procedure for transmittal of reports. The resolution follows:

> "The Commission agreed that reports should be submitted to and shall be transmitted by the Executive Director in sufficient time to allow study of the material submitted by the recipients prior to the annual meeting, and in submitting the material, the Contracting Party shall clearly indicate the articles and sections to which the material refers."

9. Election of Officers and Chairmen of Standing Committees.

Rule of Procedure number 13 provides that each national section in turn shall be represented in the offices of Chairman, Vice-Chairman and Secretary. Mr. Edward W. Allen of the United States was selected as Chairman for the year beginning February 1, 1956. Mr. George R. Clark of Canada was designated as Vice-Chairman and Mr. Iwao Fujita of Japan was chosen as Secretary.

At the 1954 Annual Meeting a formula was adopted to rotate the Chairmanships of the two standing committees between national sections also. Following this procedure Mr. Kenkichi Nakabe of Japan was designated as Chairman of the Committee on Biology and Research and Mr. Roger T. Hager of Canada was named Chairman of the Committee on Finance and Administration. All offices are for a term of one year, beginning on February 1.

The three national sections reported no changes in the membership of the standing committees. A list of the members of each committee is included in the List of Participants which is appended to this report.

10. Future Meetings.

It was decided to hold the next Annual Meeting of the Commission in Seattle, Washington for approximately one week, beginning on Monday, November 12, 1956. The Standing Committee on Biology and Research will meet during the preceding week, from November 5, and the Committee on Finance and Administration will begin its meetings on November 8.

The Commission approved the scheduling of an interim meeting of the Standing Committee on Biology and Research in Honolulu, for approximately one week, beginning on February 6, 1956. The interim meeting was required to allow further analysis of results of research in 1955 and coordination of plans for 1956 investigations.

At the closing session of the 1955 Annual Meeting the Canadian and United States sections thanked their hosts in Japan and especially the members of the Japanese National Section for their hospitality. Spokesmen for all the sections commented on the growth of mutual understanding and confidence among the members of the Commission and praised Chairman Fujita of Japan for his skillful conduct of the 1955 Annual Meeting, which concluded, after six plenary sessions, on November 5, 1955.

APPENDIX I

List of Participants

OFFICERS OF THE MEETING

CHAIRMAN
Iwao Fujita, Japan

VICE-CHAIRMAN
Edward W. Allen, United States

SECRETARY
George R. Clark, Canada

MEMBER GOVERNMENTS

CANADA

Commissioners.

George R. Clark
Ottawa, Canada

John M. Buchanan
Vancouver, B. C.

James Cameron
Pender Harbor, B. C.

Roger T. Hager
Vancouver, B. C.

Advisers and Experts.

J. W. MacNaught
A. W. H. Needler
R. E. Foerster
John Halstead

JAPAN

Commissioners.

Iwao Fujita
Tokyo, Japan

Koh Chiba
Tokyo, Japan

Masao Okai
Tokyo, Japan

Kenkichi Nakabe
Tokyo, Japan

Advisers and Experts.

Kyuhei Suzuki
Koichiro Kobayashi
Sakari Masuda
Motosaku Fujinaga
Harumi Takeuchi
Shigeru Kida
Shinichi Watari
Kenzo Kawakami
Yasumatsu Miyake
Wataru Miyakawa
Hiroshi Ohki
Tomonari Matsushita

Advisory Committee.

Yoshimi Hirano
Tatsuro Kubo
Sakae Sato
Seizo Sano
Kisaburo Taguchi
Yasuo Haraguchi
Hiroshi Tominaga

UNITED STATES

Commissioners.

Milton E. Brooding
San Francisco, California

Edward W. Allen
Seattle, Washington

John H. Clawson
Anchorage, Alaska

John L. Farley
Washington, D.C.

Advisers.

Clinton E. Atkinson
Francis M. Fukuhara
William C. Herrington
Robert Parker
William F. Thompson
Lionel A. Walford
J. Owen Zurhellen, Jr.

Advisory Committee.

C. L. Anderson
Richard S. Croker
Larry Fitzpatrick
DeWitt Gilbert
Robert C. Kallenberg
Harold E. Lokken
T. F. Sandoz
Lowell Wakefield

OBSERVERS

S. J. Holt
Food and Agricultural Organization
of the United Nations, Rome, Italy

SECRETARIAT

Permanent.

Roy I. Jackson
Executive Director
Hiroshi Kasahara
Assistant Director

Temporary.

Interpreters:
Makoto Taji
Kei Miyakawa
Tomio Mori
Haruyuki Koyama

Document Assistants:
Haruyuki Sakiura
Shigeo Miyamoto
Hatsuro Sonehara
Masakazu Kawasaki
Kiichiro Yamahira
Norio Otsuru

Reporters:
Ann Ratte
Ruth Katsurayama
Masumi Harada
Ikuko Mizukami
Chiyoko Takeuchi
Sachiko Shirai

Typists:
Reiko Ishige
Atsu Oshima

MEMBERSHIP OF STANDING COMMITEES

Standing Committee on Finance and Administration

CANADA
Commissioner—Roger T. Hager
Adviser—George R. Clark

JAPAN
Commissioner—Masao Okai
Adviser—Shigeru Kida

UNITED STATES
Commissioner—John L. Farley, Chairman
Adviser—Donald P. Loker

SECRETARIAT Roy I. Jackson
Hiroshi Kasahara

Standing Committee on Biology and Research

CANADA
Commissioner—James Cameron, Chairman
Advisers—A. W. H. Needler, Convener
R. E. Foerster

JAPAN
Commissioner—Kenkichi Nakabe
Advisers—Motosaku Fujinaga
Yasumatsu Miyake

UNITED STATES
Commissioner—John H. Clawson
Advisers—William F. Thompson
Lionel A. Walford

SECRETARIAT Roy I. Jackson
Hiroshi Kasahara

APPENDIX II

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

Agenda

as adopted for the

ANNUAL MEETING — 1955

Tokyo, Japan — October 31 to November 5, 1955

1. Call to order by the Chairman.
2. Introductions.
3. Addresses of welcome.
4. Responses.
5. Adoption of Agenda.
6. Submission by the National Sections of lists of experts and advisers.
7. Establishment of procedures of the meeting.
   - (a) Attendance at meetings.
   - (b) Press releases.
8. Report by the Chairman.
9. Report by the Secretary.
10. Report by the Executive Director including:
    - (a) Accounts.
    - (b) Budget.
    - (c) Other matters.
11. Report of the Committee on Biology and Research.
12. Consideration of research programs.
    - (a) Progress in 1955.
    - (b) Program for 1956.
    - (c) Statistical system.
13. Consideration of implementation of the provisions of the Convention.
    - (a) Article III.
    - (b) Protocol to the Convention.
    - (c) Reports required under Article III (1) (c) (iii) Article VIII and Article X (2).
    - (d) Other articles.
14. Report by the Committee on Finance and Administration.
15. Consideration of administrative and fiscal matters.
    - (a) Accounts.
    - (b) Auditors' Report.
    - (c) Matters which may require amendment of the Rules of Procedure or the Financial Regulations.
      - (i) Consideration of Mr. James' views and recommendations as to the future long-term administrative and operating policies of the Commission.
      - (ii) Delegation of authority by the Executive Director.
      - (iii) Establishment of a Working Capital Fund.
      - (iv) Currency in which salaries are payable.
      - (v) Transferability of funds between appropriation sections.
      - (vi) Time of submission of budget estimates with respect to fiscal procedures of Contracting Parties.
    - (d) Consideration of the budget for 1956-57.
    - (e) Publication policy.
    - (f) Other business.
16. Other business.
17. Election of officers and determination of the membership of standing committees.
18. Date and place of next annual meeting.
19. Adjournment.

APPENDIX III

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

Rules of Procedure

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RULES OF PROCEDURE

REPRESENTATION

Rule 1.

The Commission established pursuant to the terms of the International Convention for the High Seas Fisheries of the North Pacific Ocean signed at Tokyo on May 9, 1952, hereinafter referred to as "the Convention," is composed of three national sections each consisting of not more than four members appointed by the governments of the three respective Contracting Parties (hereinafter referred to as Commissioners). Each national section shall promptly inform the Secretary of the Commission of any change in its membership and the name of the Commissioner designated as its correspondent under Rule 22.

Rule 2.

When an Advisory Committee is established by any Contracting Party as provided in Article II Section 8 of the Convention, the national section of such Contracting Party shall promptly notify the Secretary of the Commission of the membership of such Advisory Committee and thereafter of any change in its membership.

MEETINGS

Rule 3.

The Commission shall hold a regular annual meeting at such time and place as may be agreed upon by the Commission, but such meeting shall be not less than two weeks prior to the expiration of the term of office of the existing officers of the Commission. Any other meetings of the Commission shall be called by the Chairman upon request of a majority of the national sections at such time and place as the Commission may determine.

Rule 4.

At all meetings of the Commission, including those *in camera,* each national section shall be entitled to be accompanied by an interpreter or interpreters.

Rule 5.

Each Advisory Committee shall be entitled to attend all sessions of the Commission except those held *in camera,* but its members shall not be entitled to vote.

Rule 6.

At any meeting of the Commission each national section shall be entitled to be accompanied by such experts and advisers as it may select, a list of whom shall be submitted at or before the commencement of such meeting, provided, always, that no expert or adviser shall attend sessions of the Commission held *in camera* unless invited by the Commission.

Rule 7.

The Commission may from time to time determine what additional persons may be invited or permitted to attend any meeting as guests or observers.

Rule 8.

No person other than a Commissioner, shall be entitled to address the Commission except upon permission by the Chairman and subject to the objection of any Commissioner.

VOTING

Rule 9.

Each national section shall have one vote which may be cast by any Commissioner from such national section.

Rule 10.

Decisions of the Commission shall be made only by a unanimous vote of the three national sections, except that decisions pursuant to Article III, Section 1 (c) (ii) shall be made by a unanimous vote

of the two national sections concerned. Votes shall be taken by voice vote, by show of hands, by roll call, or by ballot, as in the opinion of the Chairman appears to be most suitable.

Rule 11.

Whenever a measure is presented to a meeting of the Commission which comes within the terms of the proviso contained in Article III, Section 1 (c) (ii) the non-participating national section shall be entitled to take part in the meeting but not in the decision or recommendation with reference to such measure.

Rule 12.

Between meetings of the Commission, votes may be taken by mail or other means of communication. Such votes shall be transmitted to the Chairman of the Commission by the correspondent of each national section.

OFFICERS

Rule 13.

At its annual meeting the Commission shall select from different national sections a Chairman, Vice-Chairman, and Secretary, who shall hold office for a period of one year, which period shall commence on February 1 of each year. Selection of a Chairman, Vice-Chairman and Secretary from the national sections shall be made in such manner as will permit each national section, in turn, to be represented in those offices.

DUTIES OF CHAIRMAN

Rule 14.

The powers and duties of the Chairman will be:

(a) To call annual and other meetings in accordance with the provisions of Rule 3;

(b) To preside at all meetings of the Commission;

(c) To decide all questions of order raised at the meeting of the Commission, subject to the right of any national section to request that any ruling by the Chairman be submitted to the Commission for decision by vote;

(d) To call for votes and to announce the result of the vote of the Commission;

(e) To determine after consultation with the three national sections and the Executive Director provisional agenda for any Commission meeting so that the Executive Director may transmit the provisional agenda to all Contracting Parties and Commissioners not less than 60 days in advance of the meeting;

(f) To sign on behalf of the Commission a report of the proceedings of each annual or other meeting of the Commission, for transmittal to the Contracting Parties, Commissioners and others concerned;

(g) Generally to make such decisions and give such directions to the Executive Director, especially in intervals between meetings of the Commission, as may appear to be desirable to carry out the business of the Commission efficiently and in accordance with its decisions; and

(h) To take such other actions on behalf of the Commission as may be assigned by decision of the Commission.

DUTIES OF VICE-CHAIRMAN

Rule 15.

If the office of Chairman shall become vacant, or if the Chairman is unable to act, the duties of the Chairman shall be performed by the Vice-Chairman until the Chairman is able to act or until a successor is selected as provided by Rule 17. Such assumption of the duties of the Chairman by the Vice-Chairman shall not affect the rotation of offices in the succeeding year.

DUTIES OF SECRETARY

Rule 16.

The duties of the Secretary shall be:

(a) To sign on behalf of the Commission official communications to the Contracting Parties;

(b) To receive and transmit to the national sections communications from the Contracting Parties as required;

(c) To keep the records of Commission meetings and to prepare the draft of the report referred to in Rule 14 (f);

(d) To prepare minutes of all Commission meetings and promptly transmit to the national sections copies thereof;

(e) To maintain official files of the Commission and records of actions taken;

(f) To conduct correspondence on behalf of the Commission;

(g) To perform such other duties as are set forth in these Rules or as may be assigned by decision of the Commission.

Rule 17.

In the event that any office shall become vacant other than by expiration of the term of such office, the vacancy shall be filled for the remainder of such term by a Commissioner to be selected by the Commission from the same national section as the former occupant of such office.

EXECUTIVE DIRECTOR

Rule 18.

The Commission may appoint an Executive Director who shall have the following powers and duties:

(a) The Executive Director shall employ such staff as shall be designated by the Commission. Subject to the general supervision of the Commission, he shall have full power and authority over the staff. He shall be responsible to the Commission for the management of its office. He shall be responsible for all monies received by the Commission and shall receive and disburse the same in compliance with the financial regulations and directions of the Commission. He shall conduct, on behalf of the Commission, correspondence on routine and miscellaneous matters involving questions of fact; on questions of policy previously determined by the Commission; and on future programs which have been formally adopted by the Commission.

(b) He shall make all necessary arrangements for the meetings of the Commission and its Committees. He shall, after consultation with the Chairman, prepare annual budget estimates and transmit them to the Commissioners at least 60 days in advance of the meeting at which they are to be considered.

(c) He shall assist the officers of the Commission in the performance of their duties when requested, and shall perform such other functions as may be assigned to him by the Commission or by the Chairman.

The Commission shall fix the tenure, rate of remuneration, and travelling expenses for the Executive Director and members of the staff, and may adopt such staff regulations as are considered desirable.

(d) The Executive Director is empowered to delegate to the Assistant Director, or in his absence, to the senior member of the staff, such of his powers as he may consider necessary for the effective implementation of his responsibilities.

COMMITTEES

Rule 19.

1. Standing Committees. There shall be two standing committees:

(a) Committee on Finance and Administration, which shall consist of one Commissioner from each national section and one adviser or expert selected by each national section. Its functions shall be to investigate matters of finance and administration and such other matters as may be referred to it by the Commission and to submit reports and recommendations to the Commission concerning such matters.

(b) Committee on Biology and Research, which shall consist of one Commissioner from each national section and two experts selected by each national section. Its functions shall be to investigate matters of biology and research and such other matters as may be referred to it by the Commission and to submit reports and recommendations to the Commission concerning such matters.

2. *Ad hoc* Committees. The Commission may from time to time establish such temporary committees as it may desire.

3. Selection of Membership. Each national section shall select its representatives upon each committee and may change such selection from time to time.

FINANCIAL MATTERS

Rule 20.

The Commission may adopt, and from time to time may amend, financial regulations necessary to the conduct of its fiscal affairs.

Rule 21.

The annual budget shall be adopted by the Commission and submitted to the Contracting Parties in accordance with the financial regulations.

AGENDA

Rule 22.

No subject matter which involves amendments of the Rules of Procedure, Financial Regulations, decisions or recommendations under Article III, Section 1 (a), (b) and (c) of the Convention shall be the subject of a decision by the Commission,

unless the subject matter has been included in the provisional agenda which has been circulated through the Executive Director to the Commissioners at least 60 days in advance of the meeting at which the matter is to be discussed.

NATIONAL SECTION CORRESPONDENT

Rule 23.

Each national section shall designate one of its members who shall have primary responsibility for correspondence on behalf of his national section during the periods between meetings. Designation of such correspondent shall not preclude correspondence with other Commissioners as the need arises.

OFFICIAL LANGUAGES

Rule 24.

The official languages of the Commission shall be English and Japanese. Proposals and data may be submitted to the Commission in either language.

REPORTS

Rule 25.

The Commission shall publish, following its regular annual meeting, a report of its meetings and activities during the preceding year and shall publish such other reports from time to time as it may deem desirable.

AMENDMENTS TO RULES

Rule 26.

These Rules of Procedure may be amended from time to time, provided such amendment is not inconsistent with the provisions of the Convention.

APPENDIX IV

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

Financial Regulations

TABLE OF REGULATIONS

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Section II ..... The Financial Year
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FINANCIAL REGULATIONS

Section I — Applicability

1.1 These regulations shall govern the financial administration of the International North Pacific Fisheries Commission.

Section II — The Financial Year

2.1 The financial year shall be the period from July 1 to the following June 30, both dates inclusive.

Section III — The Budget

3.1 The annual budget estimates shall be prepared by the Executive Director after consultation with the Chairman of the Commission.

3.2 The annual budget estimates shall cover income and expenditures for the financial year to which they relate. They shall be presented in the currency of the United States.

3.3 The annual budget estimates shall be divided into Sections corresponding to the organization and program and shall be accompanied by such information, annexes and explanatory statements as may be requested on behalf of the Commission, and such further annexes or statements as the Executive Director may deem necessary and useful.

3.4 The Executive Director shall submit at the regular annual meeting of the Commission, budget estimates for the following two financial years. The estimates shall be transmitted to all Commissioners at least sixty days prior to the opening of the regular annual meeting of the Commission.

3.5 Upon submission of the estimates at the regular annual meeting of the Commission, they shall be referred to the Standing Committee on Finance and Administration for examination.

3.6 The Standing Committee on Finance and Administration shall prepare a report to the Commission.

3.7 The budget for the following financial year shall be adopted by the Commission after consideration of the report on the estimates by the Standing Committee on Finance and Administration. The Budget for the later of the two financial years for which estimates are submitted in accordance with Financial Regulation 3.4 shall be considered by the Commission but not adopted until the following annual meeting.

3.8 After adoption by the Commission the budget shall be submitted to the Contracting Parties for their approval.

3.9 Supplementary estimates may be submitted by the Executive Director when and as he deems necessary. After consultation with the Chairman, the Executive Director shall submit such estimates, in a form consistent with the annual budget, and recommended assessments on the respective Contracting Parties to each national section for approval. Upon receipt by the Executive Director of each national section's approval thereof, the estimates and the assessments shall be deemed to have been adopted by the Commission and shall be submitted to the Contracting Parties for approval.

3.10 In the event that any Contracting Party or Parties should not approve any budget adopted

by the Commission, the Secretary shall immediately notify each national section of the fact. The Executive Director, after consulting with the Chairman, shall recommend to each national section such revisions of the budget as seem desirable and such revisions of the respective Contracting Parties' assessments as may be necessary. Upon receipt by the Executive Director of each national section's acceptance of such recommendations, the revised budget and assessments shall be deemed to have been adopted by the Commission and shall be submitted to the Contracting Parties for approval.

Section IV — Appropriations

4.1 The appropriations voted by the Commission shall constitute, after approval of the budget by the three Contracting Parties, an authorization to the Executive Director to incur obligations and make payments for the purposes for which the appropriations were voted and up to the amount so voted.

4.2 Appropriations shall be available for obligation during the financial year to which they relate.

4.3 Appropriations shall remain available for twelve months following the end of the financial year to which they relate to the extent that they are required to discharge obligations in respect of goods supplied and services rendered in the financial year and to liquidate any other outstanding legal obligations of the year. The balance of the appropriations shall be surrendered in accordance with Regulation 5.2 (c).

4.4 At the end of the twelve-month period provided in Regulation 4.3 above, the then remaining balance of any appropriation retained will be surrendered in accordance with Regulation 5.2 (c). Any unliquidated prior year obligation shall at the time be cancelled, or where the obligation remains a valid charge, transferred as an obligation against current appropriations.

4.5 No transfer between appropriation Sections may be made without authorization by the Chairman.

Section V — Provision of Funds

5.1 The appropriations, subject to the adjustments effected in accordance with the provisions of regulation 5.2, shall be financed by contributions from the Contracting Parties in accordance with the provisions of Article II paragraph 11 of the International Convention for the High Seas Fisheries of the North Pacific Ocean. Pending receipt of such contributions the appropriations may be financed from the Working Capital Fund.

5.2 In the assessment of the contributions of Contracting Parties, adjustments shall be made to the amounts of the appropriations approved by the Commission and the three Contracting Parties for the following financial year in respect of:

(a) Supplementary appropriations for which contributions have not previously been assessed on the Contracting Parties;

(b) Miscellaneous income for which credits have not previously been taken into account, and any adjustments in estimated miscellaneous income previously taken into account;

(c) Any balance of appropriations surrendered under regulations 4.3 and 4.4.

5.3 After the Commission has adopted the budget and determined the amount of the Working Capital Fund, the Secretary shall;

(a) Submit the relevant documents to the Contracting Parties;

(b) Inform the Contracting Parties of their assessments in respect of annual contributions and advances to the Working Capital Fund;

(c) Request them to approve the budget and remit their contributions and advances.

5.4 Contributions and advances shall be payable in United States currency. Contributions shall be payable in semi-annual installments. The first installment of contributions and the advances shall be considered due as of the first day of the Fiscal Year to which they relate. The second installment shall be considered due as of the first day of the second half of that Fiscal Year. As of the first day of the following financial year, the unpaid balance of such contributions shall be considered to be one year in arrears.

5.5 Payments made by a Contracting Party shall be credited first to the Working Capital Fund and then to the contributions due in the order in which the Contracting Party was assessed.

5.6 The Executive Director shall submit to the regular annual meeting of the Commission a report on the collection of contributions and advances to the Working Capital Fund.

Section VI — Funds

6.1 There shall be established a General Fund for the purpose of accounting for the expenditures of the Commission. The contributions paid by Contracting Parties under regulation 5.1 and miscellaneous income and any advances made from the Working Capital Fund to finance general expenditures shall be credited to the General Fund.

6.2 There shall be established a Working Capital Fund in an amount and for purposes to be determined from time to time by the Commission. The source of monies of the Working Capital Fund shall be advances from the Contracting Parties determined in the same manner as the contribution to the annual administrative budget.

6.3 Advances made by Contracting Parties to the Working Capital Fund shall be carried to the credit of the Contracting Parties which have made such advances.

6.4 Advances made from the Working Capital Fund to finance budgetary appropriations during a financial year shall be reimbursed to the Fund as soon as and to the extent that income is available for that purpose.

6.5 Except when such advances are recoverable from some other source, advances made from the Working Capital Fund for unforseen and extraordinary expenses or other authorized purposes shall be reimbursed through the submission of supplementary estimates.

Section VII — Other Income

7.1 Miscellaneous income shall be credited to the General Fund and shall consist of all income other than:

(a) Contributions to the annual and other budgets;

(b) Refunds of direct expenditures made during the financial year;

(c) Advances or deposits made for a specified purpose.

Section VIII — Custody of Funds

8.1 The Executive Director shall deposit and maintain the funds of the Commission in an account in the name of the Commission in a bank selected by him.

Section IX — Internal Control

9.1 The Executive Director shall:

(a) Establish detailed financial procedures in order to ensure effective financial administration and the exercise of economy;

(b) Cause all payments to be made on the basis of supporting vouchers and other documents which ensure that the services or goods have been received, and that payment has not previously been made;

(c) Designate the officers of the Secretariat who may receive monies, incur obligations and make payments on behalf of the Commission;

(d) Maintain an internal financial control which shall provide for an effective current examination and/or review of financial transactions in order to ensure:

(i) The regularity of the receipt, custody and disposal of all funds and other financial resources of the Commission;

(ii) The conformity of obligations and expenditures with the appropriations or other financial provision voted by the Commission;

(iii) The economic use of the resources of the Commission.

9.2 No obligations shall be incurred until allotments or other appropriate authorizations have been made in writing under the authority of the Executive Director.

9.3 The Executive Director may, after full investigations and with the approval of the Chairman, authorize the writing off of losses of cash, stores and other assets, provided that a statement of all such amounts written off shall be submitted to the Auditors with the annual accounts.

Section X — The Accounts

10.1 The Executive Director shall maintain such accounting records as are necessary and shall submit to the Commission annual accounts showing for the financial year to which they relate:

(a) The income and expenditures;

(b) The status of appropriations, including:

(i) The original budget appropriations;

(ii) The appropriations as modified by any transfers;

(iii) Credits, if any, other than the appropriations voted by the Commission;

(iv) The amounts charged against those appropriations and/or other credits;

(c) The assets and liabilities of the Commission.

He shall also give such other information as may be appropriate to indicate the current financial position of the Commission.

10.2 The annual accounts and accounting records of the Commission shall be presented in the currency of the country in which the headquarters of the Commission is located.

10.3 The annual accounts shall be submitted by the Executive Director to the Auditors not later than ninety days following the end of the fiscal year.

Section XI — External Audit

11.1 The accounts of the Commission shall be audited annually by a competent firm of certified public accountants selected by the Commission.

11.2 The Auditors, in addition to certifying the accounts, may make such observations as they deem necessary with respect to the efficiency of the financial procedures, the accounting system, the internal financial controls and, in general, the financial consequences of administrative practices.

11.3 The Auditors shall submit their report to the Commission not later than six months following the end of the financial year to which the accounts relate. The Standing Committee on Finance and Administration shall forward to the Commission its comments, if any, on the audit report.

Section XII — Bonding

12.1 The Executive Director shall be bonded by a reputable bonding company in such an amount as may be determined by the Commission from time to time. The cost of the premium shall be paid by the Commission.

Section XIII — Delegation of Authority

13.1 The Commission may empower the Executive Director to delegate to other officers of the Secretariat such of his powers as it may deem desirable.

Section XIV — General Provisions

14.1 These regulations shall be effective as of the date of their approval by the Commission and may be amended by the Commission from time to time.

14.2 In case of doubt as to the interpretation and application of any of the foregoing regulations, the Executive Director is authorized to rule thereon after consultation with the Chairman.

WORKING CAPITAL FUND

At the 1955 Annual Meeting the Commission adopted the report of the Committee on Finance and Administration including the following resolution for the purpose of establishing a Working Capital Fund.

FINANCIAL RESOLUTION TO ESTABLISH A WORKING CAPITAL FUND

1. The Working Capital Fund shall be established and maintained during the ensuing financial period at the amount of $5,864.75 Canadian funds. Funds for initial establishment of the Working Capital Fund shall be derived from the surplus available from the 1954-55 fiscal period.

2. Members shall make advances to the Working Capital Fund in accordance with the scale of contributions prescribed by the Convention for contributions to the Administrative Budget of the Commission.

3. The Executive Director is authorized to advance from the Working Capital Fund:

(a) Such sums as may be necessary to finance budgetary appropriations pending receipt of contributions. Sums so advanced shall be reimbursed as soon as receipts from contributions are available for the purpose;

(b) Such sums as may be necessary to finance unforseen and extraordinary expenses, with the prior approval of the Commission. The Executive Director shall make provision in the budget estimates for the ensuing fiscal year for reimbursing the Working Capital Fund.

(See Report of Committee on Finance and Administration as adopted by the Commission at its Fifth Plenary Session, November 4, 1955.)

APPENDIX V

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

ANNUAL MEETING – 1955

First Report of the Committee on Biology and Research

I — REVIEW OF PROGRESS IN RESEARCH IN 1955

In accordance with the recommendation adopted by the Commission at its annual meeting in 1954, each member country submitted a progress report on research to the Secretariat by September 20, 1955. These reports show that each member country has made substantial progress in its part of the Commission's program of research, as adopted in 1954. Up to the present, little analysis of data has been possible as field work has only recently been completed. The following resume is, therefore, based on preliminary results only. Greater detail may be found in the progress reports themselves.

1. Offshore Distribution of Salmon.

Japan recorded detailed data on catches of salmon by motherships operating west of 175°W. longitude during 1955. A Japanese government research vessel took over 14,000 salmon in the course of a special cruise to the Aleutian area and the Bering Sea which was related to the Commission's program of distribution studies. The United States operated three vessels, which studied the offshore distribution of salmon in the Gulf of Alaska and south of the Aleutians. These Japanese and United States research vessels also collected oceanographic data, carried on some tagging operations and assisted in collection of material and data for all parts of the research program.

2. Identification of Stocks of Salmon.

Japan has made morphological and meristic measurements from salmon collected by its research vessel and has collected a considerable number of samples for further study in connection with the problem of identification of stocks. The United States, with the assistance of Canada and Japan, has collected very extensive samples and measurements of sockeye, pink and chum salmon from the North American coast, the high seas, and certain Asian areas. Analysis of this great volume of material (pertaining to more than 50,000 fish) has begun.

The United States has commenced analysis of growth characteristics of North Pacific salmon as shown by the annual marks on scales. These studies have already found many points of difference between fish of different river stocks.

Canada has commenced a study of the anatomy of salmon to find characteristics by which stocks of various origins may be identified. Emphasis was placed this year on studying the changes which take place as salmon mature so as to distinguish these from geographical differences.

Biochemical and physiological studies by the United States are showing promise of finding distinctive characteristics of various stocks.

Studies of parasites of young and adult sockeye, pink and chum salmon are being made by Canada and the United States in close co-operation, and collections have been made by Japan for future study. Differences in the parasites of various stocks are already emerging.

3. Study of Movements by Tagging.

Japan tagged 679 salmon captured by gill nets on the high seas. The United States studied various techniques and materials for tagging and carried out coastal and high seas tagging operations from three vessels. A total of over 1700 tags was applied but particular stress was given to attacking the very difficult problems of capturing and tagging fish on the high seas without damage and developing a tag that will remain fixed until maturity without harming the fish. Its initial tagging has indicated returns in usable proportion can be obtained by development of methods of tagging and capture.

Canada made progress in the capture and tagging of young salmon. Seining was the most successful of various catching methods tried and a plastic tube the most promising of a number of tags tested in experiments in tanks. About 3700 salmon in their first year in the sea were tagged as far as twelve miles off the B. C. coast.

4. Oceanography.

All vessels engaged in research for the Commission's program collected plankton samples and made oceanographic observations, recording temperature, salinity and other pertinent measurements. In addition the three countries co-operated, independently of the Commission's program, in operation *Norpac*. This was a comprehensive co-ordinated oceanographic investigation of the North Pacific Ocean carried out in August, 1955. The data from this program, when available, will be of great value to the Commission in relating distribution of salmon in the North Pacific to the physical environment.

II — MODIFICATIONS AND EXTENSION OF THE RESEARCH PROGRAM IN 1956

In studying the programs and results of research reported by the three countries, the Committee reaffirmed the necessity of continuing studies along each of the four lines on which work has been started. In considering needs for modification and extension of the program, the Committee was guided by the principle that it is necessary to co-ordinate researches as far as possible so as to make the best use of all resources in fulfilling the purposes of the Convention. The Committee agreed to the following recommendations:

1. Offshore Distribution of Salmon.

a. The entire oceanic range of salmons should be surveyed simultaneously as thoroughly as the facilities of the three countries permit, in order to sample adequately the distribution of all populations in space and time. This necessitates the operation of research vessels as well as sampling of the catches of commercial vessels fishing offshore.

b. The survey by research vessels should begin as early in 1956 as weather conditions permit, namely about May 15. It should continue as long as resources permit.

c. The survey should extend from about 40°N Lat. northward as far into the Bering Sea as sea conditions permit.

d. Canada and the United States will concentrate their operations in the eastern half of this area; Japan in the western half; and the operations of the three countries will be closely co-ordinated by joint planning, frequent re-examination of the results as the survey progresses, and adjustment of plans as those results indicate. The assistance of the Secretariat will be invaluable in facilitating the exchange of information.

e. The following vessels are expected to be available for this program:

Canada	1 vessel for six months
Japan	6 vessel months
United States	7.5 vessel months

f. The Committee expects to recommend plans for operations of research vessels in greater detail later during this meeting of the Commission.

2. Identification of Stocks.

Since this subject of research is still in the stage of development of methods, each of the three countries should encourage the study of every technique that holds promise of revealing characters which will distinguish Asian from American salmons.

At the same time, measurements, techniques of measurements, the design of sampling, and the interpretation of scales should be closely co-ordinated so that data collected by the three countries will be quantitatively comparable. The Committee appointed a special working party (called the Technical Sub-Committee) to arrange means of effecting such co-ordination. (See also under "Co-ordination of Research," below.)

3. Study of Movements by Tagging.

Tagging also is still in the stage of developing methods although usable techniques are at hand for certain aspects of the research. Methods of taking large quantities of salmon in good enough condition for tagging need to be improved and tested; methods of tagging salmon so that a large proportion of the marked fish will survive also require improvement. For the immediate future, each of the three countries should encourage studies in all techniques of catching and marking that hold promise of success. The Committee on Biology and Research should follow results of all tagging studies closely, so as to arrange a fully co-ordinated tagging program when tests indicate the necessity of such.

4. Oceanography.

The bearing which oceanographic information has on understanding the abundance, distribution and movements of sea fishes has been well demonstrated by Japanese studies. To extend knowledge of

this subject for the purposes of the Convention, to determine the relations of oceanographic and meteorological phenomena between the eastern and western Pacific and to learn how the patterns of water masses affect the distribution of salmon, it is essential that the three countries make adequate provision for oceanographic research and that they co-ordinate their oceanographic programs to cover the salmon areas of the North Pacific Ocean. A comprehensive oceanographic survey of these areas, such as was carried on in 1955 as part of Operation *Norpac* should be repeated in 1956 and the data collated with the offshore distribution of salmon.

III — STATISTICS NEEDED BY THE COMMISSION

The Committee considered the statistics needed by the Commission to achieve the purposes of the Convention. It recognized that the nature and scope of the statistics should be such as to fulfill the requirements of Articles III and IV and of the Protocol. It recommends:

a. that statistics regarding the principal species covered by the Convention be compiled by the Commission;

b. that statistics to be compiled include catches of each of the principal species covered by the Convention by area as recommended in a special report prepared by the Secretariat. In addition it is recommended that the following information be compiled: fishing effort by area for each species; escapements of salmon; salmon hatchery operations and production; catches of herring by ages, insofar as available; numbers of young salmon migrating seaward, insofar as available.

The Committee believes that the required statistics can be submitted by each country in a form sufficiently compiled to enable the Secretariat to complete the compilation without the services of a specially trained statistician at this time.

IV — CO-ORDINATION OF RESEARCH FOR THE COMMISSION

Recognizing that the parts carried out by the three member countries must be welded into a single research program which will fulfill the purposes of the Convention, the Committee reaffirms the importance of co-ordination of their efforts. It emphasizes the need for standardization of methods and exchange of data to assure that results are comparable and that each member country have understanding of and confiidence in all parts of the program.

The Committee noted the need for co-ordination in the following matters:

a. techniques of collection of data and of sampling;

b. interpretation of scales in age determination and growth studies, a particularly difficult field in which to obtain standardization and one in which exchange of material is imperative;

c. statistics required for the purposes of the Convention;

d. oceanographic observations and plankton collections.

The Committee appointed a Technical Subcommittee, to consider the means of obtaining standardization as noted above.

The Committee recognizes the potential value of the Secretariat in assisting in carrying out agreed programs, in arranging detail of co-operation, in assembling and distributing information and material. It recommends that it be used to the full but that responsibility for recommending a co-ordinated program of research remain with the Committee.

V — KING CRAB RESEARCH

The Committee reviewed the progress of research on king crab as summarized in progress reports; it noted that Japan and the United States plan to continue work along the same lines already started, and the Committee made no recommendations for changes in program.

VI — TIME AND PLACE OF INTERIM MEETING

The Committee recommends that an interim meeting be held early in February, 1956.

Second Report of the Committee on Biology and Research

VII — REPORT OF TECHNICAL SUB-COMMITTEE

The Committee reviewed and adopted the attached report of the *ad hoc* Technical Sub-Committee referred to in Section IV of the Committee's First Report.

VIII — PROGRAM OF OPERATION OF VESSELS FOR DISTRIBUTION STUDIES AND SAMPLING

The Committee has considered more detailed plans for the operations of research vessels for studies of the offshore distribution of salmon and for sampling of the salmon stocks (see Section II-1 of the Committee's First Report) and recommends as follows:

a. For the simultaneous sampling of the entire oceanic range of salmons commencing about May 15, the areas to be covered by the Japanese commercial fishery and by the research vessels of the three countries will be approximately as shown in the accompanying chart. Methods of fishing and making observations will be planned so that results will be comparable.

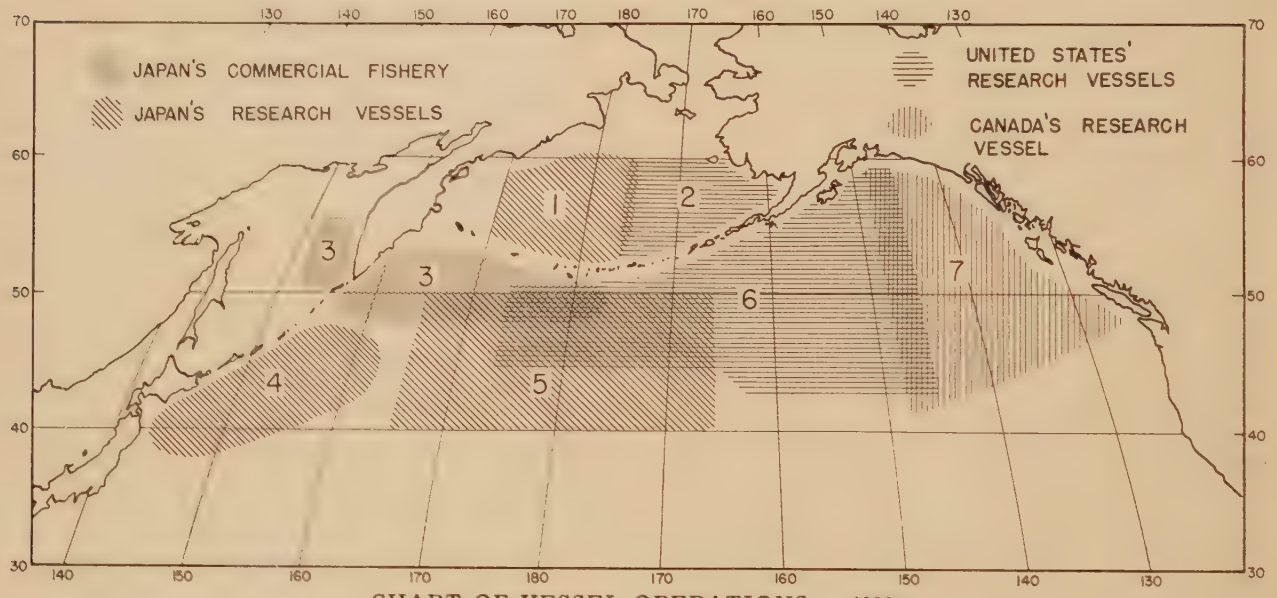


CHART OF VESSEL OPERATIONS — 1956

As early in the season as possible one Japanese vessel will start at the western side of the Bering Sea *(1) and one United States vessel at the eastern side (2). The two vessels will work towards each other and their areas of operation will meet, and perhaps overlap, in the central part of the Bering Sea.

Samples will be collected from the catches of the Japanese commercial fishing, which is expected to cover the areas indicated by (3). A Japanese research vessel from the Hokkaido prefectural laboratory will take samples in the area at the western side of the Pacific as indicated by (4) where same material can also be obtained from the commercial fishery based on Hokkaido. Two Japanese research vessels (chartered) will work in the area indicated by (5). Two United States vessels will obtain samples in the area (6) indicated by horizontal lines south of the Aleutian Islands and the Alaska Peninsula. A Canadian research vessel will operate in area (7) working westward from the coast of North America to meet United States vessels.

The southern boundary of the area to be covered will be decided during the operation by fishing far enough to the south to run out of the salmon area. Exact boundaries between operations by various agencies may be adjusted to obtain the most complete coverage possible. It is expected that the entire area may be covered by sampling stations spaced not more than 5° of longitude apart.

b. In addition to the operations noted above, it is expected that the United States vessels will operate in the southern part of the area before and after this simultaneous survey. It is also expected that the Canadian research vessel will operate until Autumn. So far as possible these additional operations will be planned so as to obtain comparisons between samples early and late in the season to indicate movements of various types of salmon and so as to lay the basis for designing more extensive sampling in 1957.

* These numbers indicate the vessels on the accompanying chart.

IX — PLANS FOR SALMON TAGGING IN 1956

The Committee reports further details of the plans for tagging by each country in 1956 as follows:

A research vessel of the Japanese Fisheries Agency will engage in tagging, accompanied by oceanographic observations, in April and May. It is planned to proceed from 170°E. Long., 40°N. Lat., eastward to 165°W. Long., 40°N. Lat., northward to 165°W. Long., 45°N. Lat., and westward to 170°E. Long., 45°N. Lat.

The United States will carry on vessel operations for tagging research from two aspects; First, the development of improved methods of capturing and marking salmon on the high seas, in conjunction with the experiments on development of new tags. It is expected that two vessels will operate for the necessary experimental work for three vessel months. Second, the application in large scale tagging experiments of what has already been learned, particularly with regard to the successful use of seining and tagging of sockeyes. During the course of this work improvements may be expected, and species other than sockeye will be tagged. It is planned to use the Aleutian Islands where commercial operations with seines already exist as a base, expanding to the west, north and south, as experience shows to be feasible. It is not yet known how extensive this operation can be made, since it depends in part upon the present experimental work. It will include trial of all promising methods on all species taken, as well as those methods of demonstrated worth.

Canada will continue and expand the program of tagging small salmon in their first year in the sea. It is planned to charter a small seiner to catch and tag young salmon in the areas studied in 1955 and a larger vessel to search for, catch and tag young salmon further to sea. It is also planned to tag salmon in connection with the operation of the vessel for distribution studies and sampling noted in Section VIII.

X — INFORMATION REQUESTED BY JAPAN PURSUANT TO ARTICLES III, VIII, and X 2

The Committee discussed the material already submitted by Canada and the United States in answer to questions asked by Japan during the First Meeting and the First Annual Meeting of the Commission.

The representatives of the United States and of Canada undertook to supply in the near future maps illustrating the material submitted and showing positions of salmon streams, salmon canneries, fishways and similar works, hatcheries, counting weirs, and the areas to which fisheries regulations and closures apply. It was explained that some of this information is so detailed as to make presentation on maps difficult, but that as much would be shown as possible.

The representatives of the United States reported that additional material for 1954 regarding Article III 1 (c) (iii) was already on hand and would be submitted during the present meetings.

XI — STUDIES REQUIRED UNDER ARTICLE III, 1 (a)

The representatives of Japan inquired regarding the areas to which the policy of permitting a 50 per cent. escapement applied and the means of obtaining it. For Canada, it was stated that the policy was to attempt to obtain the escapement which would produce the maximum number of young salmon rather than any particular percentage, that the fishery was watched closely and regulated on short notice to assure escapements, following the general principles outlined in Dr. Needler's statement on the last page of the *Report of the First Annual Meeting*. For the United States it was stated that the 50 per cent. rule applied only in the rivers in Alaska where counting weirs are operated (about 25 among a total of about 3,500) and does not apply in the States of Washington, Oregon and California. Regulations are based on the relationship of the size of the escapement and the resulting numbers of young salmon as indicated by special investigations.

The term "for personal use," when referring to salmon catches, was explained as meaning for the use of those catching the salmon and not for sale.

Answer to an inquiry regarding methods of fishing used in Alaska was postponed, as it could be made more effectively in association with the maps referred to earlier in the section.

XII — STATEMENT BY THE UNITED STATES ON KING CRAB

The representatives of the United States made the following statement:

a. The Japanese and U.S. industry should be commended for exercising reasonable restraint in their exploitation of the King Crab resources of Eastern Bering Sea and hope that the industry will continue to exercise such restraint pending the development of additional information on the extent of and proper utilization of the resource through the work of the Committee on Biology and Research.

b. It is hoped that the closely co-ordinated work of the Japanese and the U.S. biologists working in this area can obtain for us more specific information as to the time and extent of the female moult, and what effect the gear now used in the fishery has upon the resource during this period.

c. There is some indication that during certain periods numbers of male crabs which are in a so-called "soft" condition—not full of crab meat —enter the fishery. It is hoped that on this matter also, the biologists will be successful in obtaining additional pertinent information during the 1956 fishing season.

Report of the Technical Sub-Committee

Adopted by the
Committee on Biology and Research
November 3, 1955

In accordance with the action of the Committee on Biology and Research the Technical Sub-Committee met on October 27, 28 and November 1 to consider the subjects of standardization of sampling techniques and the need for certain records for the statistical reports of the Commission.

I — INTERPRETATION OF SCALES IN AGE AND GROWTH STUDIES

The Sub-Committee reviewed the method of scale analysis being used by various agencies and the differences in the personal interpretation of certain scale types.

For the purpose of assuring consistent age readings, the Sub-Committee agreed that scales or plastic impressions of one hundred scales each from pink salmon, chum salmon and red salmon be exchanged between the three countries. According to the plan Canada will send samples to Japan, Japan to the United States, and the United States to Canada; the first samples will be submitted before December 1. The readings will be compared at the interim meeting of the committee. The Sub-Committee recommends that the method of reporting total age, such as now being used by Canada and United States, is preferable to those systems which only record the number of winter marks or checks.

In order to study the growth pattern of scales which may be of value for identification of races, a graphical method was proposed. The Sub-Committee recommends that scientists of the three countries who are engaged in scale research examine the method developed by Dr. Koo for possible adoption. This method may eliminate some of the differences in personal interpretation and may provide a basis for direct comparison between the readings of the investigators of the three countries. Dr. Koo will provide a graphic analysis of the one hundred red salmon scales exchanged with the other countries.

Because of the different time of appearance of scales along the body of the young fish, the part of the fish where the scales are taken is extremely important. Accordingly the Sub-Committee recommends that all future scale samples collected for this study be taken from the part of the body just below the dorsal fin and two or three rows above the lateral line.

The Sub-Committee recommends that three sets of impressions be made for all samples next year (1956) in order to provide a complete set of scale samples for the reference and study of each country. The following information will be forwarded with each sample—length, sex, date and place of collection and type of gear. The three species to be studied in detail will be the pink, chum and red salmon.

It is proposed that in collecting the scale sample only a single complete scale be taken from the fish, cleaned and placed on gum tape in such a way as to permit plastic impressions to be made without additional sorting and mounting. The United States agrees to send Japan (1) a description of the scale press, (2) a supply of plastic mounting cards, and (3) a sample of gummed tape.

II — TECHNIQUES OF COLLECTION OF DATA AND OF SAMPLING

A basic measurement of length of fish must be adopted for all comparisons. The Sub-Committee recommends that this measurement be from the

middle of the eye to the end of the hypural plate. It is important to obtain the actual measurements made in this way.

Racial samples should be measured, if at all possible, after *rigor mortis* has ceased; exceptions should be noted.

The Sub-Committee discussed certain difficulties in the use of the drum-type measuring machine used in 1955 but it was agreed that no better method could be found which would give the accuracy now obtained by the machine with a minimum of personal error.

Although difficult to obtain the weight of salmon accurately in the field (especially on the high seas), the Sub-Committee recommends that an attempt be made to obtain this information during the coming year. It was pointed out that certain differences in the length-weight relationship have been found by Japanese workers to be typical of certain races of fish and accordingly the weights might prove to be a valuable character in the racial studies. The Sub-Committee recommends that all measurements and weights be taken in the metric system whenever possible and if this is impossible because of the design of certain available equipment, the results should be converted and reported in metric system, with notation that the measurements have been converted.

III — PROBLEMS OF SAMPLING

The Sub-Committee notes the importance of the size of the sample and recommends that this subject be fully considered at the interim meeting when more data will be available.

One of the most important basic problems of sampling is the effect of the selectivity of gear on the catch and escapement. This is particularly important in the present problem since the high seas fishery and certain land-based fisheries are conducted mainly by gillnets selectively fishing certain sizes. The Sub-Committee agreed that the samples must represent the stocks fished. Consideration must be made of the areas, the time and the gear used.

From all evidence available, the high seas fishery is not as selective as certain of the land-based fisheries. In the analysis it might be possible to overcome the effect of gear by comparing the racial characters of fish of the same age groups.

IV — STATISTICS

The Sub-Committee considered the variation in the production unit reported by each country. For example, Canada reports both number and weight of salmon, Japan motherships report only the number, Japan land-based fisheries report the weight, Alaska reports only the number, State of Washington reports both the number and weight, and the States of Oregon and California report only weight.

Other questions pertain to the time period and the area division. The Sub-Committee recommends that the salmon catch be compiled by weeks in number and weight. The Sub-Committee further recommends that statistics of the salmon catches of all three member countries be provided to the Commission in as detailed breakdown by area as is now available and that the catch be reported so far as possible by gear, with information on the quantity and type of gear used. The Sub-Committee believes that the Commission's office should file for future reference as many detailed records of the salmon catch as possible.

The type of data on the crab fishery found in the Secretariat's report appears to be adequate at this time.

II. Administrative Report for 1955

By the Executive Director
ROY I. JACKSON

On July 15, 1955, the writer succeeded Mr. Milton C. James as Executive Director of the International North Pacific Fisheries Commission. Mr. James, the Commission's first Director, had established temporary headquarters for the Secretariat at the University of British Columbia in Vancouver, Canada in August, 1954. He had agreed to serve the Commission on a temporary basis until a permanent Director could be found and resigned in June, 1955. Dr. Hiroshi Kasahara, Assistant Director, served as Acting Director during the interim.

The report which follows deals with activities of the Secretariat during 1955 and includes information on administrative matters not found elsewhere in this Annual Report.

1. Changes in Commissioners.

There were changes in membership of each of the National Sections of the Commission during 1955. For Canada, Mr. George R. Clark replaced Dr. Stewart Bates on February 1, 1955. For Japan, Mr. Shigeo Maetani replaced Mr. Tadashi Kiyoi on February 1, 1955. Mr. Koh Chiba replaced Mr. Ryuji Takeuchi on April 5, 1956; Mr. Kenkichi Nakabe replaced Mr. Koichiro Kobayashi on October 17, 1955 and Mr. Masao Okai replaced Mr. Shigeo Maetani on October 21, 1955. For the United States, Mr. John H. Clawson replaced the Honorable B. Frank Heintzleman on April 6, 1955. A roster of all Commission members is printed inside the front cover of this Report. Each national section is limited by the Convention to not more than four Commissioners—in practice, each country has maintained a full complement.

2. Votes.

In the interval between the 1954 and 1955 Annual Meetings the Commission voted by correspondence on several questions, with results as follows:

1. Designated Mr. George R. Clark, Canadian Commissioner, to act as observer on behalf of this Commission at the 1955 Annual Meeting of the International Commission for the Northwest Atlantic Fisheries. —March 12, 1955.

2. Selected Mr. George R. Clark, Canadian Commissioner, as Secretary to fill the vacancy left by the resignation of Dr. Stewart Bates in accordance with Rule of Procedure 17. —April 12, 1955.

3. Authorized the then Executive Director, Mr. Milton C. James, to attend the International Technical Conference on the Conservation of the Living Resources of the Sea, which was convened by the United Nations, as an observer for this Commission. —March 15, 1955.

4. Appointed Dr. Hiroshi Kasahara, Assistant Director, as Acting Director, during the period of Mr. James' absence and prior to the appointment of his successor. —March 12, 1955.

5. Appointed Mr. Roy I. Jackson as Executive Director succeeding Mr. Milton C. James. —July 8, 1955.

6. Appointed Peat, Marwick, Mitchell and Co. as auditors for the Commission. —September 13, 1955.

7. Approved issuance of invitations to the following organizations to be represented by observers at the 1955 Annual Meeting. —September 23, 1955.

   International Pacific Halibut Commission.
   International Pacific Salmon Fisheries Commission.
   Pacific Marine Fisheries Commission.
   Inter-American Tropical Tuna Commission.
   Food and Agriculture Organization of the United Nations.

3. Fiscal and Administrative Matters.

The report of the Commission's auditors, Peat, Marwick, Mitchell and Co. is appended to this administrative report. The financial statement shows that the cost of operation of the Secretariat for the period from its establishment in August, 1954 to the close of the fiscal year on June 30, 1955 totalled $26,036.63 (Canadian Funds). A surplus of $5,864.75 was accounted for primarily by the fact that the Executive Director was on leave without pay for

several months and that the staff was not organized until some time after the fiscal year began.

The Secretariat of the Commission has two principal functions at present. The first of these functions is purely administrative in nature and includes arrangements for the annual and other meetings, preparation and publication of minutes, reports and similar material, obtaining and exchange of reports, data, samples and other material required by the various contracting parties, preparation of budgets and agendas, and similar activities.

The second function involves assisting the Commission in co-ordination of its research program. The present research program of the Commission was adopted at the 1954 Annual Meeting. It is concerned prinicipally with the problem assigned to the Commission by the Protocol to the Convention —the determination of whether or not salmon originating in Asian streams mingle with salmon from North American streams and, if so, the location of a line which will best divide the stocks—and also with studies of the king crab stock of the eastern Bering Sea. The scientific investigations required by the Commission are executed by the research agencies of the contracting parties. Co-ordination of the various phases of the research work is accomplished in several ways: through the activities of the Commission and its Standing Committee on Biology and Research, principally at the Annual Meetings; through correspondence and interim meetings of scientists concerned in the work, and through the year-round activities of the Secretariat.

During 1955 the Secretariat was occupied almost entirely with administrative and organizational activities. Activities in research co-ordination were confined to the collection and compilation of statistical material from the three countries, about which more will be said later, and to the obtaining and exchange of programs, progress reports and information on research activities. Plans were developed for broader and more active participation in research co-ordination in 1956.

4. Publications.

The Commission published an annual report and two research bulletins during 1955, as follows:

1. *Report of First Annual Meeting, October 25 to 29, 1954.*
   International North Pacific Fisheries Commission. Vancouver, B. C., Canada.
   In Japanese and English.
2. 1. Foerster, R. E.—*The Pacific Salmon of the Canadian Coast.*
   2. ————*On the Salmon in the Waters Adjacent to Japan.*
   3. Atkinson, C. E.—*A Brief Review of the Salmon Fishery in the Aleutian Islands Area.*
   4. Taylor, F. H. C.—*The Pacific Herring Along the Pacific Coast of Canada.*
   5. Tully, J. P.—*Oceanography Along the Canadian Pacific Coast.*
   Bulletin No. 1 of the International North Pacific Fisheries Commission, Vancouver, B. C., Canada, June, 1955.
3. Fleming, Richard H.—*A Review of the Oceanography of the North Pacific.*
   Bulletin No. 2 of the International North Pacific Fisheries Commission, Vancouver, B. C., Canada, June, 1955.

These publications have been distributed to interested scientists, libraries and research institutions in Japan, Canada, the United States and elsewhere throughout the world. Wherever possible they are exchanged for other desired publications to aid in building the Commission's library. A basic policy for the preparation and distribution of Commission publications was prepared by the Secretariat and adopted by the Commission at the 1955 Annual Meeting.

5. Statistics.

At the 1955 Annual Meeting the Secretariat presented the Commission with a detailed proposal for compilation of statistics for those fisheries in the Convention area which are of direct concern to the Commission. The proposal included a sample compilation of salmon, crab, halibut and herring data for the years 1952, 1953 and 1954. The Commission adopted the recommendation of the Committee on Biology and Research that the statistical recommendations of the Secretariat be adopted. In addition the Commission approved further statistical recommendations of the Committee on Biology and Research. These recommendations are contained in the Committee Reports, which are appended to the Chairman's Report.

The Secretary of the Commission subsequently asked the governments of the three Contracting Parties to provide the statistical information desired

by the Commission, in accordance with the provisions of Article VIII of the Convention.

6. Attendance at Other Meetings.

As reported elsewhere, the former Executive Director, Mr. Milton C. James, represented the Commission as an observer at the International Technical Conference on the Conservation of the Living Resources of the Sea, held in Rome from April 18 to May 10, 1955. Mr. George R. Clark, Deputy Minister of Fisheries for Canada and a member of this Commission, acted as an observer at the Annual Meeting of the International Commission for the Northwest Atlantic Fisheries, held in Ottawa, June 6 to June 11, 1955.

The present Executive Director attended a meeting of the International Pacific Salmon Fisheries Commission held in Vancouver, Canada on December 9, 1955. An invitation was received to attend the Annual Meeting of the Pacific Marine Fisheries Commission but personal reasons prevented attendance.

APPENDIX I.

PEAT, MARWICK, MITCHELL & CO.
CHARTERED ACCOUNTANTS
410 SEYMOUR STREET
VANCOUVER 2
B. C.

AUDITORS' REPORT TO THE COMMISSION

We have examined the balance sheet of the International North Pacific Fisheries Commission as of June 30, 1955 and the statements of income and expenditures and receipts and disbursements for the year ended on that date and have obtained all the information and explanations we have required. Our examination included a general review of the accounting procedures and such tests of accounting records and other supporting evidence as we considered necessary in the circumstances.

In our opinion the balance sheet and statements of income and expenditures and receipts and disbursements are properly drawn up so as to exhibit a true and correct view of the state of the affairs of the Commission at June 30, 1955 and the results of its operations for the year ended on that date, according to the best of our information and the explanations given to us and as shown by the books of the Commission.

PEAT, MARWICK, MITCHELL & CO.,
Chartered Accountants.

Vancouver, B. C.
September 14, 1955.

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

Statement of Assets and Liabilities
June 30, 1955
(Stated in Canadian Funds)

ASSETS

Cash in bank		$5,614.75
Deposit with United Air Lines		425.00
Office equipment, at cost	$1,822.70	
Less allowance for depreciation	182.27	
		1,640.43
		$7,680.18

LIABILITIES

Account payable		$ 175.00
Excess of income over expenditures, per accompanying statement, refundable to Contracting Parties in accordance with the Financial Regulations		5,864.75
Amount equivalent to expenditure to date on office equipment, *per contra*	$1,822.70	
Less depreciation	182.27	
		1,640.43
		$7,680.18

Statement of Income and Expenditures
Year ended June 30, 1955
(Stated in Canadian Funds)

Income:		
Contributions from Contracting Parties (U.S. funds $33,000.00)		$ 31,901.38
Expenditures:		
Personal services	$ 14,459.15	
Travel	3,328.59	
Communications	501.84	
Rent	1,250.00	
Other contractual services	3,276.14	
Supplies	875.16	
Office equipment	1,822.70	
Cost of annual meeting	523.05	
		26,036.63
Excess of income over expenditures		$ 5,864.75

STATUS OF APPROPRIATIONS

	Budget Appropriations U.S. Funds	Budget Appropriations Canadian Funds (See Note)	Expenditures	Unexpended (Over-expended) Appropriations
Personal services	$ 19,100.00	$ 18,464.13	$ 14,459.15	$ 4,004.98
Travel	5,000.00	4,833.54	3,328.59	1,504.95
Transportation of things	100.00	96.67	—	96.67
Communications	600.00	580.03	501.84	78.19
Rent and Utilities	1,200.00	1,160.05	1,250.00	(89.95)
Other contractual services	3,500.00	3,383.48	3,276.14	107.34
Supplies	900.00	870.04	875.16	(5.12)
Equipment	2,000.00	1,933.41	1,822.70	110.71
Cost of annual meeting	600.00	580.03	523.05	56.98
	$ 33,000.00	$ 31,901.38	$ 26,036.63	$ 5,864.75

Note: Converted at the average rate of exchange realized.

Statement of Receipts and Disbursements
Year ended June 30, 1955
(Stated in Canadian Funds)

Receipts:		
Contributions from Contracting Parties (U.S. funds, $33,000.00)		$ 31,901.38
Disbursements:		
Expenses:		
Personal services	$ 14,459.15	
Travel	3,328.59	
Communications	501.84	
Rent	1,250.00	
Other contractual services	3,101.14	
Supplies	875.16	
Office equipment	1,822.70	
Cost of annual meeting	523.05	
	$ 25,861.63	
Deposit with United Air Lines	425.00	
		26,286.63
Excess of receipts over disbursements, represented by cash in bank at June 30, 1955		$ 5,614.75

III. The Research Program of the International North Pacific Fisheries Commission

A. SUMMARY OF CANADIAN RESEARCH IN 1955 ON PROBLEMS RAISED BY THE PROTOCOL

Canada's part in the program of research adopted by the Commission in October, 1954, on the problems raised by the Protocol included: (1) a study of the skeletal anatomy of salmon, to seek structural differences which could be used to distinguish stocks of various origins; (2) an attempt to find parasites which can be used as indicators of the origin of salmon occurring on the high seas; (3) an attempt to catch and tag small sockeye, pink and chum salmon to indicate migrations away from rivers of origin and the fisheries to which various stocks contribute; and (4) co-operation in a study of the oceanography of the North Pacific, to provide background for understanding salmon distribution and movements. These appear in the Commission's program under items II A, II C, III 3 and IV 2 respectively. Progress in all these fields was made in 1955 and is reported in the following sections.

Canada also co-operated in other parts of the program: (a) The study of morphological and meristic characters by the United States is already showing much promise of providing the basis for distinguishing stocks of various origins. Canada assisted by supplying samples of sockeye, pink and chum salmon from Canadian waters. Samples and accompanying data were collected in northern (Skeena River), central (Rivers Inlet and Port John) and southern (Fraser River) British Columbia. (See Item II A.) (b) Blood samples of sockeye were taken at the Skeena River and at Rivers Inlet for use in the serological studies by the United States referred to in item II B of the Commission's program. (c) Assistance was given in the recovery and reporting of tags used by the United States in experiments to develop more effective methods of tagging salmon on the high seas (Item III 2 of the Commission's program).

No attempt is made here to summarize progress in the additional items of the Commission's research program undertaken by Canada at the meeting of the Commission at Tokyo, October-November 1955. These include (1) high-seas fishing as part of the co-operative attempt to sample salmon throughout their distribution, and (2) studies of scales to discover characteristics by which stocks of various origins may be distinguished. These new projects are now underway, and all the projects undertaken in 1955 are being continued and extended in 1956.

1. Skeletal Anatomy of Pacific Salmon.

The ultimate aim of this work is to find differences in bone structure by which stocks of various origins may be identified. It was, however, first necessary to study and describe the skeletal anatomy of the five species. These include *Oncorhynchus nerka* (sockeye or red), *O. gorbuscha* (pink), *O. keta* (chum), *O. kisutch* (coho or silver), and *O. tschawytscha* (spring or chinook). It was especially important to discover what changes occur as the individual salmon grows and matures; differences in structure between salmon at various stages of maturity must be distinguished from more stable hereditary differences before the latter can be used to recognize various stocks. In 1955, therefore, the objectives included (1) a thorough description of the skeletal anatomy of the five species, (2) a study of changes which occur as salmon mature, and (3) a preliminary search for skeletal characters which may be used to distinguish stocks. These phases are to be followed in 1956 by study of a few promising characters in a much greater number of samples.

Description of the skeletal anatomy of the five species. In 1955, 761 specimens were examined, taken mainly from the Fraser River area and including, insofar as possible, juveniles migrating to sea, semi-adults actively feeding at sea, maturing individuals approaching the rivers and spawning individuals. On each specimen some 40 measurements were taken, sex and stage of maturity determined, presence or absence of food in stomachs noted, and principal meristic characters counted. Colouration of specimens on the outside and in the mouth cavity was noted. Skulls and skeletons of the tail and of the paired fins were prepared and cleared in glycerine. Many hundreds of individual bones were examined and described, 32 kinds of bones being used from the skull alone. Over 500 photographs of whole fish or

their parts were taken and about 50 X-ray pictures of heads and tails. Detailed drawings of the most characteristic bones were made.

On the basis of this material a detailed and well-illustrated description of the skeletal anatomy of the five species is in preparation.

Changes which occur as salmon mature. Individuals of any one species of Pacific salmon pass during their life span through four distinct stages—juvenile stage in fresh water and then in the sea, semi-adult feeding and growing stage, maturing stage and spawning stage. The last three can, of course, be recognized by the development of the reproductive organs. It was found that they can also be recognized by the type of teeth and the size of the bones carrying them. These are (in order of importance) the premaxillary, maxillary, supralingual, vomer, palatine and pharyngeal bones, all of which carry teeth.

In young and semi-adult specimens the teeth are sharp and sit more or less directly on the respective bones. These feeding teeth are probably replaced at least once a year. In maturing individuals, which are apparently no longer feeding actively, teeth of a new type appear. These are not yet attached to the bones but are found only in the connective tissue covering them. As the season progresses the fish become sexually mature and enter fresh water. They now have strongly developed breeding teeth sitting on large ossified bases fused to the bones. The attachment of the ossified bases greatly increases the size of the bones. The premaxillary bones are particularly affected by these changes and, therefore, especially useful for distinguishing stocks in various stages of maturity.

It is believed that a study of the teeth and jaw bones of salmon taken on the high seas can indicate the onset of maturity of various bodies of fish and help complete the picture of their movements towards the fresh waters where they spawn. Examination of extensive samples from this point of view is planned in 1956.

Differences between stocks. The work in 1955 has shown what parts of the skeleton do not change as the salmon mature and has thus laid the basis for the search in 1956 for differences between stocks. This will involve the much less detailed examination of a large number of samples.

2. Parasites of Pacific Salmon.

Studies on the parasites of Pacific salmon have been carried out in close co-operation with United States investigators who have paid particular attention to chums and some to sockeye while Canadian investigators concentrated on sockeye and pinks. All available 1955 samples have not yet been examined. The results outlined below are, therefore, subject to confirmation or adjustment. A full report on 1955 samples is planned before the 1956 Annual Meeting of the Commission.

Samples have included seaward migrants, young inshore marine salmon and adult salmon from commercial catches. Seaward migrants were obtained only from North America and young marine samples only from British Columbia. Adult salmon from commercial catches and exploratory fishing have been made available from a number of places from the Columbia River north to Alaska and west to the Sea of Okhotsk through co-operation of United States and Japanese agencies. In all over a thousand specimens have been carefully examined for parasites to date. About forty species of parasites (some of them new to science) have been found, mainly in the digestive tract, but only a few of these promise to be useful in distinguishing stocks.

Pink Salmon. The number of pinks studied to date is relatively small and from American waters only. No information of value to distinguishing pink salmon stocks has been found yet. The pink fry examined (from British Columbia and Alaska) were entirely free of parasites but young pinks in the sea were soon parasitized. Four species of parasites (three trematodes and one copepod) were found both in young pinks in the sea and in adult pinks from inshore commercial catches. It is still quite possible that valuable differences in parasitization will emerge as examination of samples from other areas proceeds.

Sockeye Salmon. More samples of sockeye have already been examined and promising results have already been found.

Three parasites (the trematode *Diplostomulum*, the cestode *Diphyllobothrium* and the nematode *Philonema*) are acquired by sockeye smolts, retained throughout their life, and return to fresh water with spawners. These parasites have a freshwater life cycle but because of their wide distribution cannot be used to distinguish Asiatic from American sock-

eye. In some cases they could be used to separate local "runs" even in the same river system.

Of the many parasites found in adult sockeye some are so generally distributed as to be useless in distinguishing stocks and others are too scarce. Table I summarizes the occurrence of certain species which offer some promise, along with some others for comparison. The unbracketed numbers represent the percentage of infected individual salmon in the sample examined; the numbers in brackets are the average numbers of parasites per infected fish (i.e. not including fish free of the parasites). Samples have now been examined from five more localities (Columbia River, Rivers Inlet and Skeena River, B. C., Petersburg, Alaska, and in the Japanese high-seas fishery at 167°50'E.) These confirm the conclusions outlined below.

TABLE I.—Incidence and intensity of parasites, by species, in adult marine sockeye, 1955.

Area	Date of Capture	Trematoda				Cestoda		Nematoda			Acanthocephala	
		Brachyphallus	Lecithaster gibbosus	Hemiurus levinseni	Diplostomulum sp.	Diphyllobothrium sp.	Phyllobothrium caudatum	Philonema oncorhynchi	Contracaecum	Anisakis sp. larva	Bolbosoma	Echinorhynchus
Fraser R., B.C.	July 26	—	75(109)	—	—	40(3.5)	75(11)	10(42)	50(5)	95(5)	5(1)	—
Bristol Bay, Alaska	July 15	64(19)	88(12)	4(1)	4(1)	48(3)	88(15)	96(43)	72(16)	96(23)	44(1.3)	—
King Cove, Alaska Peninsula	July 7-Aug. 4	96(77)	92(122)	—	24(4)	—	92(19)	—	92(9)	100(15)	—	—
Attu, Aleutian Islands, Alaska	July 28-Aug. 9	29(2)	80(99)	21(1.6)	8(2)	—	92(13)	80(108)	62(6)	96(13)	8(3.5)	4(1)
48°43′ - 48°50′N. 170°23′ - 173°E.	May 18	27(3)	13(1)	27(1.5)	—	60(5)	87(17)	80(20)	67(2)	100(28)	80(6)	—
51°33′N., 159°04′E.	July 14	53(3)	7(1)	87(3)	—	80(3)	100(19)	73(19)	53(3)	100(26)	27(1.5)	93(7)
Okhotsk Sea	June 30-Aug. 10	64(2)	40(2.5)	40(3.5)	4(1)	64(5)	100(24)	85(40)	36(15)	100(22)	44(1.6)	76(7)

Two parasites are common in the samples examined from western areas and absent or rare in samples from eastern areas. The acanthocephalan *Echinorhynchus* was found in a high percentage of sockeye in the samples from the Okhotsk Sea and the far western Pacific (159°E.) and in smaller numbers at Attu; it was absent from all samples examined from east of Attu. The trematode *Hemiurus* was well represented in the four samples from Attu west; it was absent from all eastern areas except for a low incidence at Bristol Bay. The picture is less clear with the trematode *Lecithaster* but it has possible significance. This parasite was very abundant in all samples from Attu east but present in much smaller numbers to the west.

The above differences in the parasites of the sockeye examined to date from the eastern and western sides of the Pacific suggest that they may be used to distinguish between eastern and western stocks. More samples must be examined before definite conclusions can be drawn. Some 1955 samples remain to be examined and better coverage is planned in 1956. In the meanwhile the method appears to offer promise.

General. The results to date suggest that some species vary in abundance from north to south. The trematode *Brachyphallus,* for example, was found in all samples of sockeye from the high seas north of 48°N. but was absent from both sockeyes and pinks south of 48°N. on the high seas or south of Queen Charlotte Sound in British Columbia coastal waters.

There are some major differences between the parasites of adult sockeye and adult pinks in the same area (Fraser River, B. C.) and interpretations of data on parasites of one species are not necessarily applicable to others.

To summarize, the parasitological studies have indicated three parasites common in sockeye on one side of the Pacific but absent or rare on the other and offer some promise of a real contribution to an understanding of the distribution of Asiatic and

American salmon on the high seas. More sampling is needed and is in progress.

3. Catching and Tagging Young Salmon in the Sea.

The purpose of these studies is to discover the distribution of young sockeye, pink and chum salmon, their movements away from their rivers of origin and the fisheries to which they contribute. Methods of finding, catching, identifying and tagging them were developed with some success. Observations were also made on the growth and food of the young salmon and on the physical conditions and plankton. In 1955, young salmon were caught and some were tagged close to shore; in 1956, it is planned to follow them farther to sea and to tag larger numbers.

The investigation was carried out from June to September in two areas: (1) Chatham Sound and adjacent waters in which the seaward dispersion of young salmon from the Skeena River and various smaller streams could be explored, and (2) Johnstone, Broughton and parts of Queen Charlotte Straits where concentrations of fish from the Strait of Georgia were expected. The Fisheries Research Board vessels *Investigator No. 1* (60-foot trawler) and *Loligo* (80 feet) were used in the former, and *Alta* (a converted 40-foot troller) in the latter. Each vessel carried a small purse-seine, a beach-seine, gill-nets of various small meshes, several tow-nets of one-metre diameter and various mesh sizes, and equipment for fishing at night with lights. In the Chatham Sound area beach-seining and purse-seining were carried out from a 16-foot flat-bottomed skiff, with roller over the stern, which was powered with an 18-horse-power outboard motor set through a forward well. Preliminary experiments with a mid-water trawl were unsuccessful in catching young salmon but further attempts are planned in 1956.

Of the various types of gear used the beach-seine and purse-seine were most useful for catching small salmon. The beach-seine produced large catches (thousands of fish when abundant) and was operated successfully from all types of shore. By making circling sets it was used in waters too shallow for purse-seining and too far from shore for ordinary beach-seining. As many as 69 fish in one set were caught in this way. The purse-seine was used only over deep water and when the sea was calm. Catches pet set numbered less than 100 fish. Tow-nets, gill-nets and night-lights were used with very little success. The number of times each fishing method was used is given below.

Area	Beach seine		Purse-seine	Tow-net	Gill-net	Night-light
	Beach Set	Circle Set				
Chatham Sound	337	16	49	45	5	3
Johnstone Strait	106	2	19	2	1	3

Distribution and abundance. The results indicate the spread of young pink and chum salmon seaward. They concentrate along the shore until late July or early August when their movement away from the shore starts. In the Chatham Sound area, young sockeye were not caught as successfully as pinks and chums, perhaps because of their failure to concentrate on the beaches in the same manner. Such catches as were made suggest a similar seaward movement and disappearance from inshore areas late in the summer.

Catches of young pink salmon per set of beach-seines sometimes exceeded 5,000, and the seaward movement of concentrations along the shore of the straits and islands could be followed. Catches per set of young chum salmon did not exceed 500, of young sockeye 100 per set, but indicated similar seaward migrations.

Size. Changes during the summer in the average lengths of the young salmon caught do not indicate growth alone. This was especially true in the Johnstone Strait area through which salmon of the tributaries to the Strait of Georgia pass. Here fluctuations in length suggested the passage of stocks from different streams or reaching the sea at different times. In the Chatham Sound area pink salmon caught in June averaged about 65 mm. in length, those caught in September about 125 mm. Chum salmon showed somewhat similar increases in length. In general the sockeye caught in June were longer (about 78 mm.); the few caught in September averaged about 100 mm. The actual growth is probably larger than these figures indicate for all three species, the older larger fish probably leaving the inshore

areas earlier. In all three species females were slightly larger than males.

Experimental tagging of small salmon. In experimental tagging of 3- to 4-inch salmon, several types of tags were tested. These included: (a) plastic sleeves, 0.039 inch in diameter and 0.25 inch in length, attached with No. 26 gauge silver wire or 15-pound test monofilament nylon, (b) toggle tag which consisted of two small plastic balls threaded on nylon which was wound into twisted wire, (c) hook tag with streamer, and (d) 5- to 6-inch lengths of plastic "spaghetti" tubing of 0.039-inch diameter, the free ends knotted to form a small loop. After holding the tagged fish in aquaria for eleven months, some information on the relative merits of each type is available.

Toggle and hook tags, while easy to apply, caused irritation at the point of attachment shortly after tagging. The maximum periods for which these tags remained attached were 96 days and 154 days respectively. Wire tags showed considerable cutting of the flesh. Eleven of the 13 fish with this tag died within 290 days, 8 of the 11 within 70 days. Fish with monofilament nylon and "spaghetti" tags show the best survival to date (approximately 40% or roughly one-half the survival of the control fish) and some of the losses are attributed to accident. The "spaghetti" tag has the additional advantage of easy application, and therefore appears most promising.

To indicate the survival of small fish tagged with different types of tag, 722 sockeye smolts were tagged with type (a) tag with wire and 597 smolts with type (d) tag in early June at the counting fence at Lakelse River on the Skeena watershed. Some information may be available in 1956 when some of the fish return as "jacks."

Tagging in the field. A total of 4,222 small salmon were tagged mainly with "spaghetti" tags of polyethlyene tubing and some with plastic sleeves attached with wire.

Little immediate mortality was observed after tagging. Three chum salmon, released in Alert Bay, were recovered in the same area one to three days later. A coho tagged in Hardy Bay was recovered eight days later and six miles away in a commercial purse-seine.

Food. Over 90% of the 1,577 stomachs examined contained food. Important items in the food were copepods, larvacea, amphipods and euphausiids and, for coho, fish. Differences in feeding habits were indicated. In general pink, chum and sockeye were eating invertebrates, mainly small crustacea, while even at this early age coho were fish eaters. When pink and chum salmon occurred together the chum appeared to take a greater variety of food organisms.

Relation of oceanographic conditions. Two water masses were recognizable in Chatham Sound on the basis of volumes and composition of zooplankton and of temperatures and salinities. One is a shoreward movement of cold oceanic water rich in copepods. The other is plankton-poor, warmer and more brackish as a result of fresh water from the Skeena and Nass Rivers. The young salmon were found most frequently in the latter during the period of this investigation.

4. Oceanography.

Knowledge of the oceanography of the North Pacific is essential to an understanding of the distribution and movements of salmon. In July to September, 1955, oceanographic agencies of Japan, United States and Canada co-operated in a survey of the Pacific north of latitude 20°N. known as Project *Norpac*. All agencies exchanged data records in February, 1956 and further analysis and publication is proceeding. This great survey, although initiated under other auspices, is of great value to the Commission's research program on the problems raised by the Protocol and this value was an important consideration in Canada's active participation.

Species	Chatham Sound "spaghetti" tag	Johnstone Strait "spaghetti"	wire	Total
Pink	614	114	61	789
Chum	129	497	98	724
Sockeye	—	1,945	154	2,099
Coho	48	284	243	575
Spring	—	5	30	35
Total	791	2,845	586	4,222

Canada's part of the *Norpac* survey was carried out by the frigate H.M.C.S. *Ste. Therese* (Fig. 1) which cruised 7,160 miles between July 26 and September 1 in the area between latitude 47°N. and the Aleutian Islands and Alaska, and between the North American coast and longitude 177°W. At 85 oceanographic stations temperatures and water samples were taken to a depth of 600 fathoms. Data were obtained on temperature, salinity, dissolved oxygen, and inorganic phosphate. Vertical plankton hauls were taken at 50-fathom intervals from the surface to 200 fathoms. Bathythermograph lowerings to 150 fathoms were made at each station and between stations, obtaining a continuous record of the changes of temperature with depth.

Fig. 1. H.M.C.S. "*Ste. Therese*," naval frigate provided by the Royal Canadian Navy and equipped to conduct oceanographic surveys in North Pacific waters for Project Norpac, August, 1955, as part of the INPFC research program for 1955.

The data obtained are being analyzed in close co-operation with United States agencies, especially the Oceanographic Laboratories of the University of Washington, which also made observations in the Northeast Pacific and Gulf of Alaska. The areas covered are particularly important to distribution of salmon in the eastern North Pacific and it is planned to prepare a joint report for presentation to the Commission before its next Annual Meeting. Analysis of the data is still proceeding and space does not permit more than a brief mention of some of the results which are emerging. The data presented in the figures came from both United States and Canadian operations.

Figure 2 shows the surface temperature distribution in August, 1955, and indicates the circulation. In a zone between latitudes 40°N. and 50°N. there is a relatively rapid change in surface temperature from south to north. South of this zone in mid-Pacific and north of it in the Gulf of Alaska, surface temperatures vary little over large areas. The zone of rapid change in temperature is also the zone where the eastward current is best developed. North of this zone the currents are in general slower and less well defined. The Gulf of Alaska is shown as an area with a slow contra-clockwise circulation and with relatively little variation in surface temperatures from place to place. It is, as it were, a great eddy with characteristics which distinguish it from the waters to the south. Recent United States exploratory fishing indicates a southern boundary for salmon and a northern boundary for tuna lying in the zone of strong eastward flow. This relates salmon distribution to the water mass north of this zone and directs attention to its nature and its extent.

Figure 3 shows the salinities along longitude 147°W. It shows a shallow surface layer of low-salinity water lying from the temperature transition zone northward. This water mass is distinct from the more saline oceanic surface water to the south. Earlier observations in the areas off the British Columbia coast indicate that this low-salinity surface layer is present throughout the year whereas temperatures, of course, vary seasonally. The intensified

exploratory fishing and oceanographic work planned for 1956 will throw light on the relationship of salmon distribution to this water mass and, it is hoped, indicate more definitely whether it is indeed "salmon water."

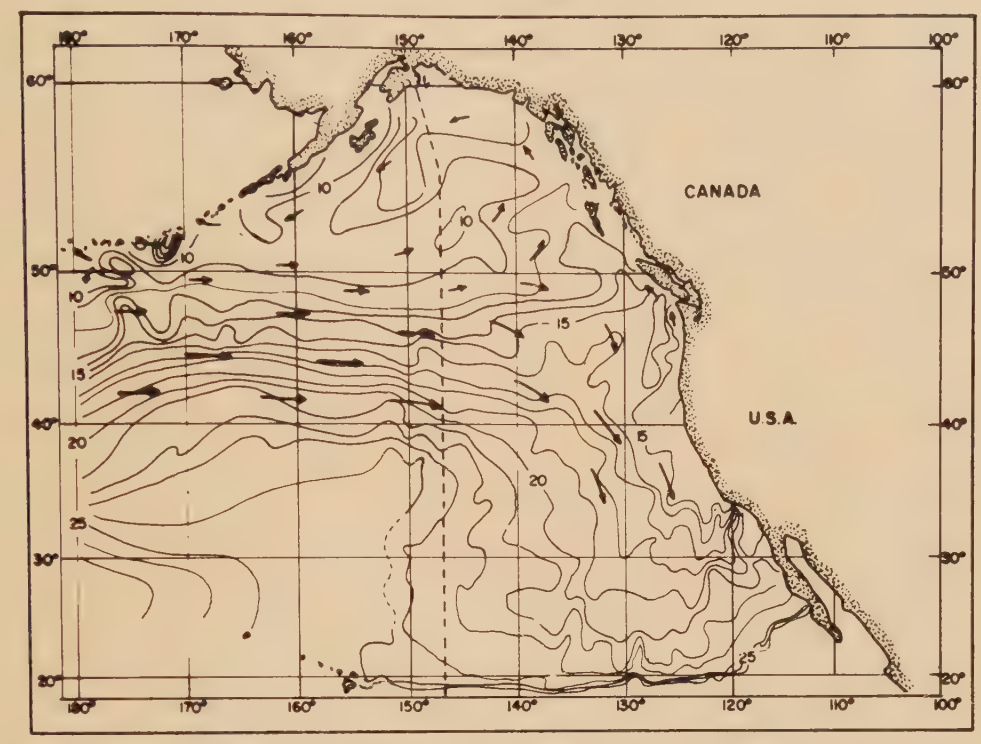


Fig. 2. Surface temperatures (in degrees Centigrade) and water movements in the Northeast Pacific, August, 1955, from results of the Norpac survey.

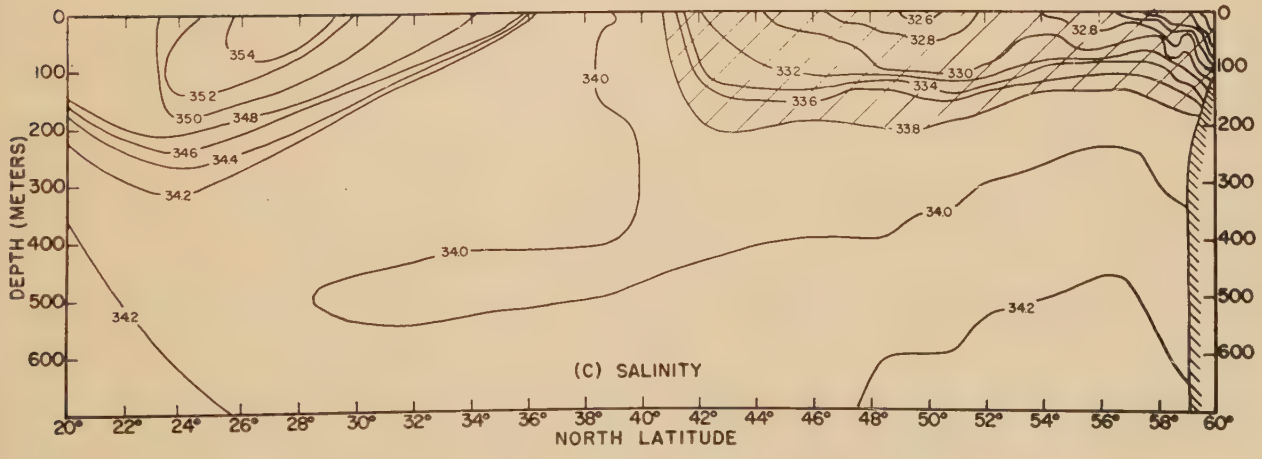


Fig. 3. Salinities in the North Pacific in a section along Longitude 147°W.

B. A SUMMARY OF SALMON RESEARCH CONDUCTED BY JAPAN IN THE NORTH PACIFIC OCEAN IN 1955 UNDER THE I.N.P.F.C. PROGRAM

FOREWORD

This report summarizes operations of the mothership-type salmon fisheries in the Aleutian area during 1955 and presents data regarding salmon sampled aboard the motherships and data collected by the government research vessel, *No. 1 Tsukiyama Maru,* during the 1955 season.

Futher analysis of this material is being carried out. At this time only a general explanation of research conducted to date can be given; no conclusions or final results are practicable at present.

I — OFFSHORE DISTRIBUTION OF SALMON

A. Collection and Analysis of Records of Commercial Catches.

Information from the mothership-type salmon fisheries in the Aleutian area is now being analyzed. The following is an outline of the changes in fishing results in relation to the time and place of operation.

Figure 1 shows that in May, 1955 many fish were caught in the area 48°30′N. - 50°N., 170°E. - 175°E. Chum salmon were predominant and red salmon were next in abundance while the

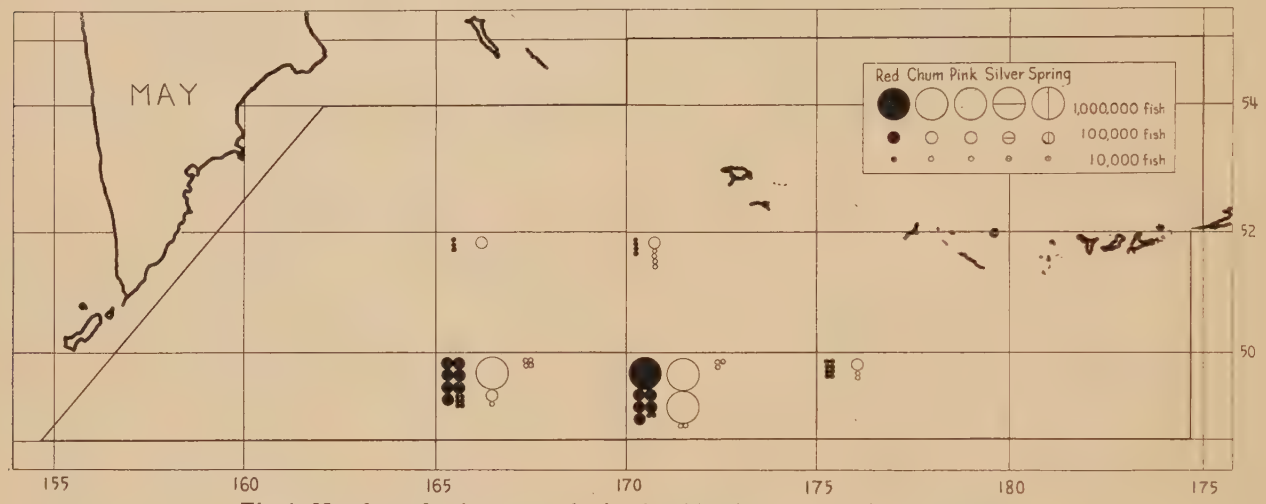


Fig. 1. Number of salmon caught in the Aleutian area during May, 1955. (Excluding the catch by scouting boats.)

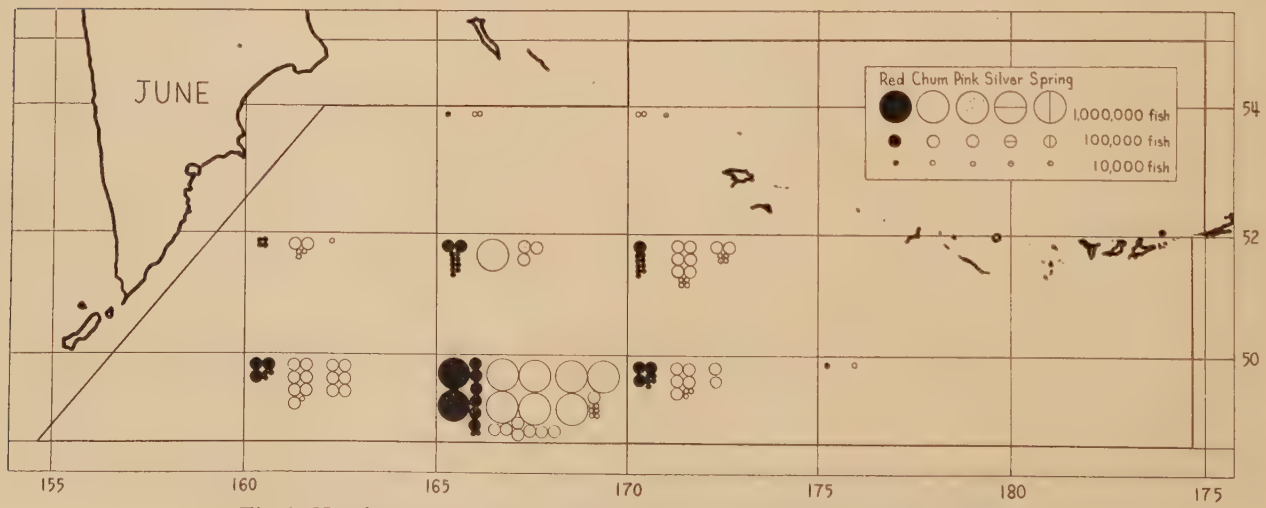


Fig. 2. Number of salmon caught in the Aleutian area during June, 1955. (Excluding the catch by scouting boats.)

catch of pinks was very small. During June, (Fig. 2) the main fishing grounds moved westward and occupied the area 48°30′N. - 50°N., 165°E. - 170°E. June showed a remarkable increase in the catch of pink salmon. Chums and reds were also plentiful. In July, (Fig. 3), the main fishing grounds moved further westward and were located in waters west of 165°E., in the vicinity of latitude 50°N. The catch of pinks increased remarkably and that of chums and reds decreased. In August (Fig. 4), the fishing grounds moved further westward than in the previous month, and many fish were caught around 50°N. Very few fish were taken east of 165°E. A rapid increase in the catch of silver salmon was noted.

Table I shows the total salmon catch by Aleutian area motherships by species and by month. From the viewpoint of the salmon industry, the most important species were reds, chums and pinks.

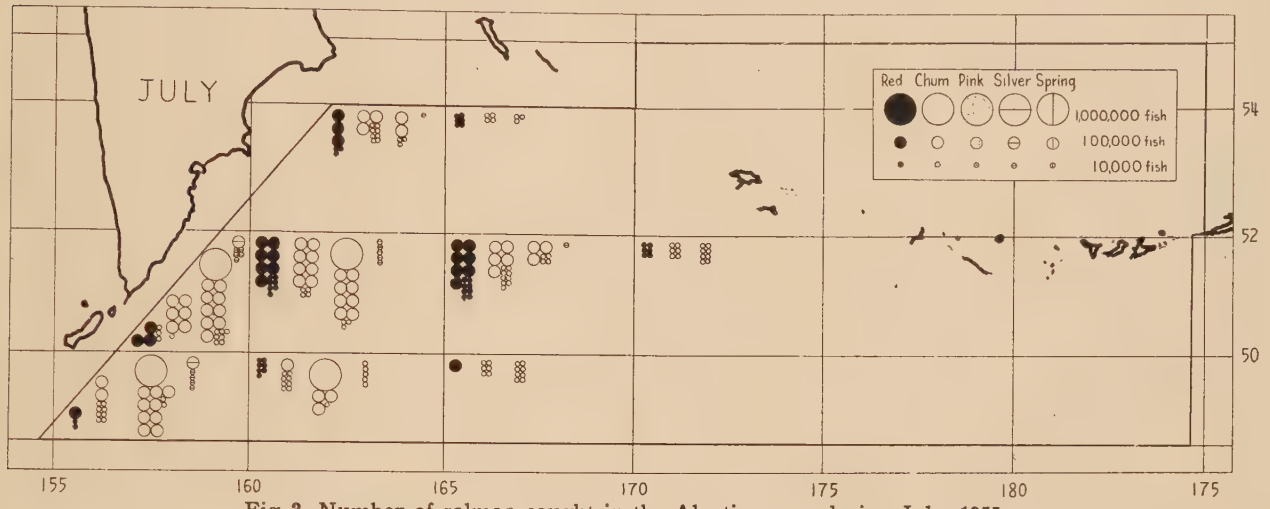


Fig. 3. Number of salmon caught in the Aleutian area during July, 1955. (Excluding the catch by scouting boats.)

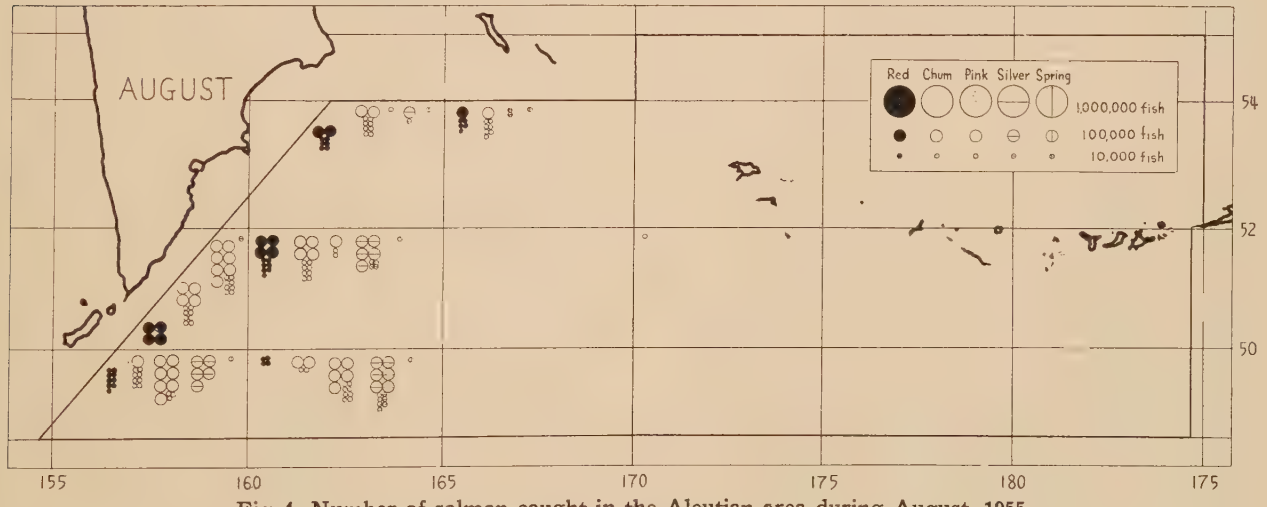


Fig. 4. Number of salmon caught in the Aleutian area during August, 1955. (Excluding the catch by scouting boats.)

TABLE I—Catch by Species of the Mothership Salmon Fishery in the Aleutian Area, 1955.
(Excluding the catches by scouting boats) (in numbers of fish)

Month	Red	Pink	Chum	Silvers	Spring	Total
May	2,415,340	73,151	3,485,752	5	2,264	5,976,512
June	3,942,880	4,522,376	7,227,340	4,559	5,999	15,703,154
July	2,619,239	7,775,424	3,034,910	512,481	12,354	13,954,408
August	1,425,877	1,870,328	1,800,422	2,178,420	42,446	7,317,493
Total	10,403,336	14,241,279	15,548,424	2,695,465	63,036	42,951,567

B. Special Fishing by Research Vessels for Scientific Material.

1. Time and area of the research. The research vessel *Tsukiyama Maru No. 1* left Hakodate, Hokkaido on May 13, 1955, began research work on May 20, continued its operations until August 21, and returned to Hakodate on August 25. The cruise plan and locations of the 63 points of observation are shown in Figure 5.

(1) Very few salmon were caught in the northeastern part of the Bering Sea.

(2) Many red salmon were caught in the southeastern part of the Bering Sea during the middle and end of June, and near the coast of the Kamchatka Peninsula during August. Small red salmon, 30 - 40 cm in length, were caught in fairly large quantities in the western part of the Bering Sea after July.

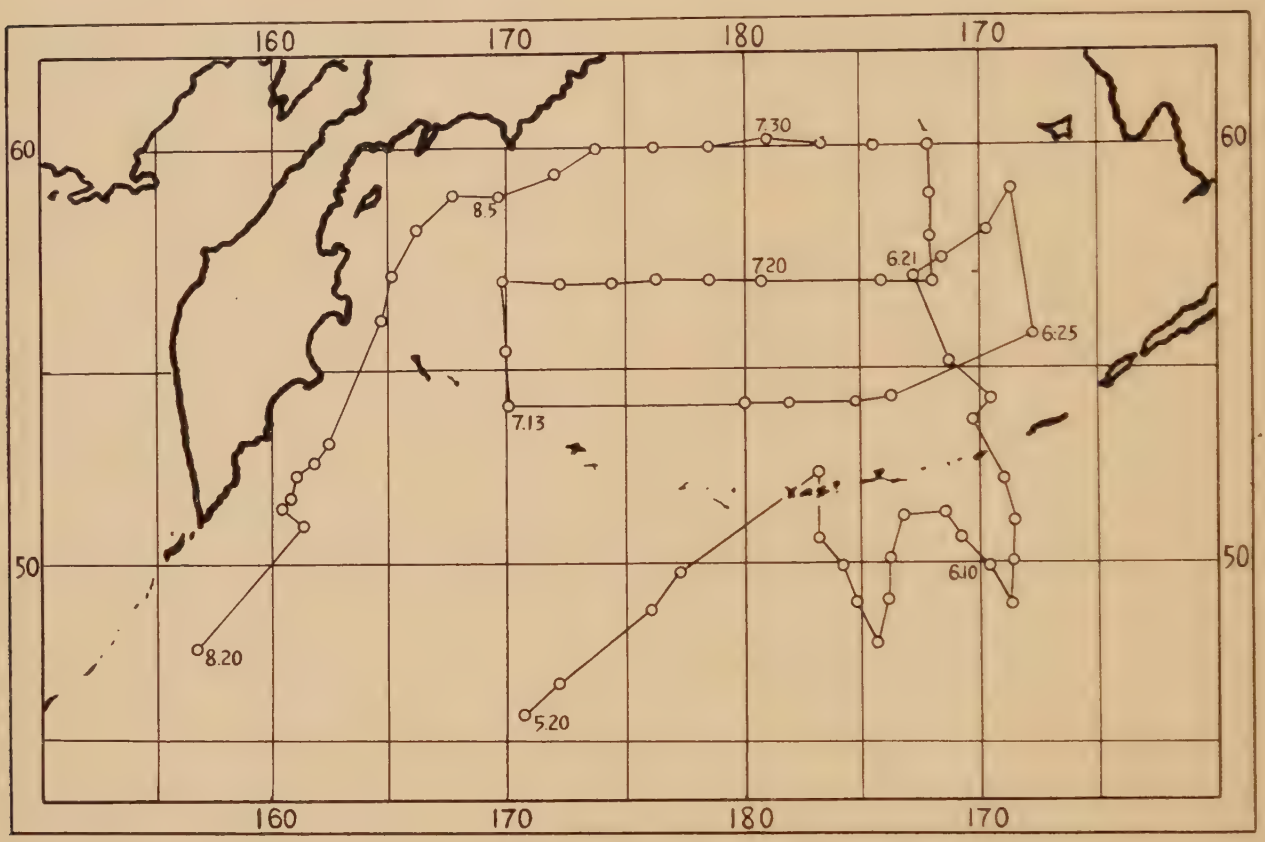


Fig. 5. No. 1 Tsukiyama Maru salmon sampling stations, 1955.

2. Fishing. The floating gillnet was the only fishing gear used. At every station from 100 to 170 "tans"* were used. Mesh sizes varied from 2.5 - 4.3 "sun"**. Since only one research vessel moved over a very large area in the Aleutians during a long period of time, care has been necessary in comparing catches made in the different areas; the time lag has also been taken into account. Keeping these factors in mind, a general trend is observable as indicated by the following facts:

(3) Chum salmon were caught over all the area explored. It is thought that this species has a rather wide range in the North Pacific. Small chums, 30 - 40 cm in length, were caught in the western part of the Bering Sea, as in the case of the red salmon.

(4) Generally speaking, many pinks were found in the southern areas and few in the northern areas.

* The "tan" is a unit of Japanese gillnet. The research vessels used a "tan" of net measuring 130 feet in length. In commercial fishing the "tan" measures 175 to 180 feet.
** One "sun" equals 1.193 inches.

(5) Many silvers were caught near the Kamchatka Peninsula in the middle of August.

3. State of Enmeshment.

(a) **Depth at which salmon became enmeshed.** Most of the salmon were enmeshed in the upper portion of the floating gillnets.* The ratio between the numbers of fish enmeshed in the upper portion and in the lower portion was approximately 76:24. There was no conspicuous difference in this trend according to the species; almost the same results were obtained for catches made in the daytime as compared with catches made at night. It seems probable that this event results from the combined influences of the depth of swimming of the salmon and the state of the mesh encountered, however, further research is needed before any conclusion can be reached.

(b) **Direction from which salmon became enmeshed.** No definite trend toward a particular direction of enmeshment within particular areas was observed for any species. The direction of enmeshment usually coincided with the direction of the current, but reverse cases were not rare. It may be necessary to consider the direction of enmeshment in relation to the degree of maturity of the fish; analysis of this matter has not yet been completed.

(c) **Location on the body at which salmon became enmeshed in the gillnets.** Generally speaking, many salmon became enmeshed at the head in the small-meshed nets and at the trunk in large-meshed nets. As an exception, most of the silver salmon became enmeshed at the head regardless of the size of mesh involved.

(d) **Vitality of gillnet-caught salmon.** Only from 5 to 10 percent of the fish caught in each set were alive upon lifting of the gillnet.

II — IDENTIFICATION OF STOCKS

A. Morphological and Meristic Studies.

Data and material on this item are now under analysis; only an outline of work conducted to date can be presented here.

1. Investigations of the Commercial Catch. Five inspectors aboard ten motherships in total sampled ten specimens of each species each day. They measured fork lengths, body weights, determined sex and collected scale samples. The plan was designed to allow each inspector to select the fishing boats for sampling systematically and to collect samples at random from each fishing boat. Operational problems aboard the motherships interfered with the success of the sampling plan.

(1) Fork Length Composition.

(a) **Red Salmon.** The average fork length throughout the season was 54.5 cm. (Fig. 6). The average length decreased until about the end of June, increased at the beginning of July and thereafter gradually decreased until the end of August. This tendency was especially conspicuous in male salmon. The males were always larger than the females.

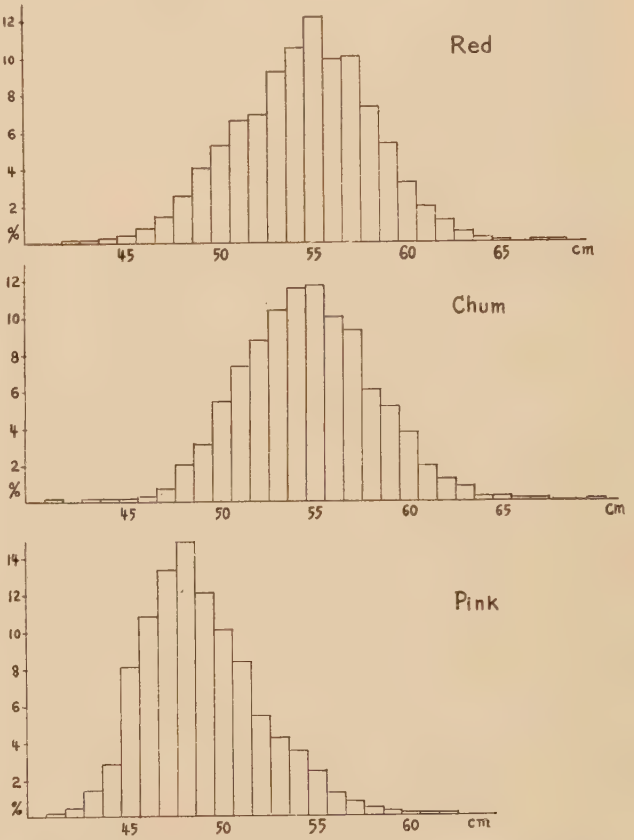


Fig. 6. Fork length composition of three species of salmon sampled aboard mother ships in the Aleutian area, 1955.

(b) **Chum Salmon.** The average fork length throughout the season was 54.6 cm. In the middle and end of August the average length decreased somewhat but this was not as marked as in the red salmon. Changes of body length of

* A net of the depth of 25 feet is commonly used.

chum salmon during the season were less than in the red salmon. No difference of average length between males and females was observed.

(c) **Pink Salmon.** The average fork length throughout the season was 48.8 cm. At the end of the season (August), the average length had increased. The range of fork length distribution of pink salmon was less than that of reds and chums. The sex ratio of the pink salmon was probably uneven, probably because of the selectivity of the gillnets.

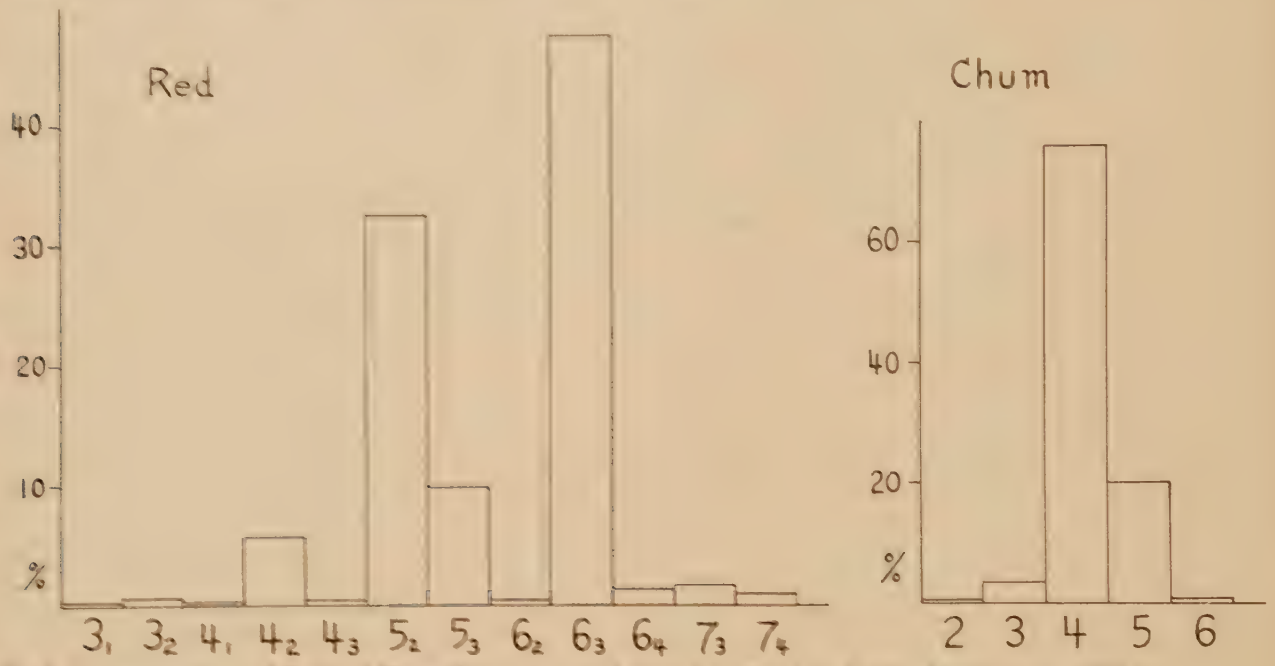


Fig. 7. Age composition of Red and Chum Salmon sampled aboard motherships in the Aleutian area, 1955.

(2) Body weight composition.

The average body weight of red salmon throughout the season was 2088 gr. The seasonal change of body weights was similar to the change in fork lengths. The average body weight of chum salmon was 2815 gr. As the season advanced, the average body weight seemed to show an increasing trend. The average body weight of pink salmon throughout the season was 1539 gr. The seasonal change of body weight of pink salmon was much the same as for chum salmon.

(3) Age composition.

The results of age determinations of the scale samples collected aboard two motherships follow. All scales from which it was difficult to determine the age on account of inconspicuous or deficient character of scale pattern were omitted. It will be necessary to make further studies on the problems of age determination in order to clarify the standards.

(a) **Red Salmon.** Over the whole season, age 6_3 comprised 47.3% of the samples and age 5_2 comprised 32.5%. Taken together, 6_3's and 5_2's comprised 80% of the whole samples. (Fig. 7.) Next came ages 5_3 and 4_2 which will appear as 6_3 and 5_2, respectively, in the next season. The age composition varied within the season and in general there were more fish of ages 6_3 and 5_2 in the early part of the season; ages 5_3 and 4_2 increased in the latter part of the season.

(b) **Chums.** Throughout the season, age 4 was overwhelming and comprised 75.9% of the commercial catch samples; a further 20.0% of the samples were age 5. Ages 4 and 5 combined accounted for 96% of the entire sample. The age composition varied more or less with the season, but age 4 was always most abundant.

(c) **Pinks.** All pinks caught were of age 2.

(4) Sex Ratio.

The selectivity of gillnets may cause the sex ratio determined from commercial samples to

differ from the natural condition, however, sufficient research has not yet been carried out on this subject. The results obtained to date are described below.

In respect of red salmon, (over the whole season), the ratio of males to females was 42:58. In the case of chums there were also more females than males; this tendency was especially remarkable in the latter half of the season. In the case of pink salmon, at the beginning of the season almost all fish caught were males, but at the end of the season this relationship was reversed and almost all fish caught were females. It seemed that two factors, namely selectivity by mesh-size and changes in natural conditions, had brought about this result.

The Research vessel *"Tsukiyama Maru No. 1,"* used by Japan for the conduct of investigations under the INPFC program in 1955.

2. Investigations by the Research Vessel. Taking into account the time and area of research, the data were divided into several groups and comparisons were made between these groups. The analysis of variations of age, sex and maturity between or within groups has not been completed; pooled values were compared. For convenience, the groups may be designated as follows:

1. **Mid-Pacific,** May 20 - 28, North Pacific west of 180°.
2. **Eastern Pacific,** June 1 - 15, North Pacific east of 180°.
3. **Southeastern Bering Sea,** June 16 - July 2, area around 170°W. to 59°N. and east of 180° along 54°N.
4. **Mid-Bering Sea,** July 13 - 21, from 170°E. to 172°W. along 57°N.
5. **Northeastern Bering Sea,** July 22 - 29, north of 57°N. and east of 178°W.
6. **Northern Bering Sea,** July 30 - August 5, from 170°E. to 179°W., from 59°N. to 60°N.
7. **Northwestern Bering Sea,** August 6 - 10, north of the Commander Islands and off the coast of the Kamchatka Peninsula.
8. **Western Pacific,** August 11 - 21, south of the Commander Islands and off the coast of the Kamchatka Peninsula.

(1) Fork Length Composition.

(a) **Reds.** With regard to fork length, the maximum average of 56.6 cm. appeared in the samples from the Southeastern Bering Sea and the minimum of 47.0 cm. appeared in the samples from the Northern Bering Sea. This phenomenon seems to reflect the presence of the group of small red salmon previously mentioned in the North Bering Sea. In general, large fish were found in the areas north and south of the Eastern Aleutian Islands. The males were usually larger than the females.

In the Mid, Northern and Northwestern Bering Sea, many small red salmon, 30 to 40 cm in fork length, were caught. It was thought that the group of red salmon of approximately 50 cm in length caught at the same time would not spawn within the season, judging from the immature state of their gonads. It is probable that many feeding groups live in the Mid and Northwestern Bering Sea.

(b) **Chums.** The average fork length of chum salmon in the Northeastern Bering Sea was large—about 55.3 cm. The minimum, 49.7 cm, was found in the sample from the North Bering Sea and was due to the appearance of small fish in the catches. The chums in the Eastern Pacific were generally large. As in the case of the red salmon, many small fish, 30 - 40 cm in length, were caught in the Mid, Northern and Northwestern Bering Sea; this may suggest the presence of feeding schools in this area. Unlike the red salmon, the female chums were larger than the males.

(c) **Pinks.** The average fork length of pink salmon increased with the advance of the season. Unlike the reds and chums, the age composition of the pink salmon was quite simple and consisted of only one year class. For this reason a definite trend of change of body length may be traced.

(2) Body Weight Composition.

(a) **Reds.** The average body weight of red salmon in the Southeastern Bering Sea was a maximum (2729 gr.) and that in the Northwestern Bering Sea was minimum (1531 gr.).

(b) **Chums.** The body weight composition of chum salmon catches differed somewhat from those of red salmon samples. The sample from the Northeastern Pacific was a maximum, (2705 gr.) and that from the Eastern Pacific was minimum, (1557 gr.). The body weight of the small fish in the Mid and Northwestern Bering Sea was about 500 gr.

(c) **Pinks.** The average body weight increased with the advance of the season. The fish caught at the close of the research cruise were twice as heavy as those caught at the beginning of the investigation.

(3) Age Composition.

(a) **Reds.** Throughout the season the most numerous age class of red salmon taken by the research vessel was 5_3 (39%), followed by 6_3 (20%), 4_2 (16.9%), 5_2 (13.6%), 4_3, 6_4 and 3_2 In the Mid Pacific, 5_3 and 6_3 were numerous and in the area along the Eastern Aleutian Chain the proportion of 4_2 and 5_2 increased. In the Mid and Northern Bering Sea the proportion of 6_3 decreased and 5_3 increased. In the western parts of the Bering Sea and the Pacific red salmon of age less than 4 increased. Almost all fish caught in the Mid and Northern Bering Sea (30 - 40 cm. in length) were of age two or age three.

(b) **Chums.** Age 4 was dominant over the whole area explored. In the Mid and Northern Bering Sea the proportion of ages 2 and 3 increased. Throughout the season age 4 was most abundant, followed by ages 3, 2 and 5.

(4) Gonad Weight Composition.

(a) **Reds.** The average gonad weight of both sexes was maximum in the Southeastern Bering Sea and minumum in the Northwestern Bering Sea. Judging from the type of distribution of gonad weight, the majority of fish sampled in the Southeastern Bering Sea seemed to comprise a group enroute to their spawning area. The gonads of the samples from the Mid and Northwestern Bering Sea were still in undeveloped stages and it was thought that the majority of these fish would not spawn within the season.

(b) **Chums.** The situation differed from that of the red salmon. The average gonad weights of the males were minimum in the North Bering Sea and maximum in the Northwestern Bering Sea. The female gonads were large in the Northeastern Bering Sea but small in the Southeastern Bering Sea. It was thought that their spawning schools spread farther north than the red salmon.

(c) **Pinks.** The gonad weight increased with the advance of the season for both sexes. It is thought that this arose from the fact that all schools caught were from the spawning group, composed of age 2.

(d) **Silvers.** Silver salmon were caught in offshore waters of the Kamchatka Peninsula in the middle and end of August. Gonads of all samples (including males and females) were well ripened and a majority of fish caught were thought to be from among those spawning within the season. The maturity of the gonads of the samples of silver salmon was a very conspicuous characteristic of this species when compared with the above three species.

(5) Correlation between body weight and gonad weight. Since these data are not grouped by area or by period they cannot be used to separate the stock, but a relation between body weight and

gonad weight can be seen. Male red salmon and chums do not show a clear relationship between the two characteristics mentioned above, but females of these species show a somewhat conspicuous relationship. Both male and female pink salmon show a relatively close relationship, that is, as the body weight increases, the gonad weight increases.

(6) Sex ratio. Throughout the season the ratio of male red salmon to females was 55.6%, but this ratio varied considerably with the area. The ratio of male chums to females was 45.9%. The proportion of female pinks increased with the advance of the season. It is not ascertainable whether this phenomenon depends upon net selectivity or upon natural change of the ratio.

(7) Fork length composition by mesh size of gillnet. A preliminary investigation was conducted in order to evaluate the effects of selectivity of gillnets, and data on fork length composition by mesh sizes for three species of salmon were obtained. The average fork length decreased in the order of reds, chums and pinks when the same mesh size was used. In other words, the same mesh size seemed to select fish differentially according to the species of fish.

B. Other Items.

Morphological studies other than those mentioned above, such as the number of gill rakers, number of pyloric caecae and studies of the chemical, physiological and parasitological characteristics have not yet been completed.

III — STUDY OF MOVEMENTS BY TAGGING

A. Tagging in the Offshore Area.

Six hundred and seventy salmon were released at almost all stations between June 2 and August 21. Judging from the behaviour of the tagged salmon immediately after release, about half of the released fish appeared to have effective vitality. Tagging experiments using fish caught by gillnet are not so effective as compared with experiments based on fish from other fishing gears, e.g. the purse-seine. One red salmon was recovered at a point about 10 miles from the point of release on the day following tagging.

B. Preliminary Tagging Experiment.

In order to obtain a tag that would be quick to attach and difficult to lose, a preliminary experiment was conducted at Hokkaido. As a result of this experiment, it was decided that a "pendant" tag, composed of a barbed needle, to which a celluloid disk was attached by a nylon thread, would be used in the 1956 season.

IV — OCEANOGRAPHY

The work of identification of plankton samples, determination of salinity, titration of the sea water and analysis of the oceanographical data is now being carried out.

A. Water Temperature.

The surface water temperature was from 5° to 6°C. in the Eastern Pacific from the end of May to the beginning of June, and showed little vertical change. The same tendency was observed in the Southeastern Bering Sea during the middle of June. In the Northeastern Bering Sea during the last ten days of June, the surface temperature dropped as the research vessel moved towards the north. After the middle of July in the Mid and Northern Bering Sea, a definite thermocline was always observable within 50 meters from the surface. This thermocline became more pronounced and shallower as the vessel went northward. The difference in temperature between the surface and the 50 meter depth was large in the Western Bering Sea and the Western Pacific during August. The influence of the warm water mass seemed to be limited only to the surface layer of the sea.

B. Tidal Currents.

A rough estimation of the tidal current was made from the distance and direction that the nets moved between the time of setting and the time of lifting. Fast and complicated tidal currents were observed near the Aleutian Chain.

A SUMMARY OF KING CRAB RESEARCH CONDUCTED BY JAPAN IN THE EASTERN BERING SEA IN 1955 UNDER THE I.N.P.F.C. PROGRAM

FOREWORD

The analysis of data and samples collected during the investigation has not yet been completed. The following is a summary of the knowledge acquired to date. In most cases the results obtained in 1955 have been compared with those from the previous investigations.

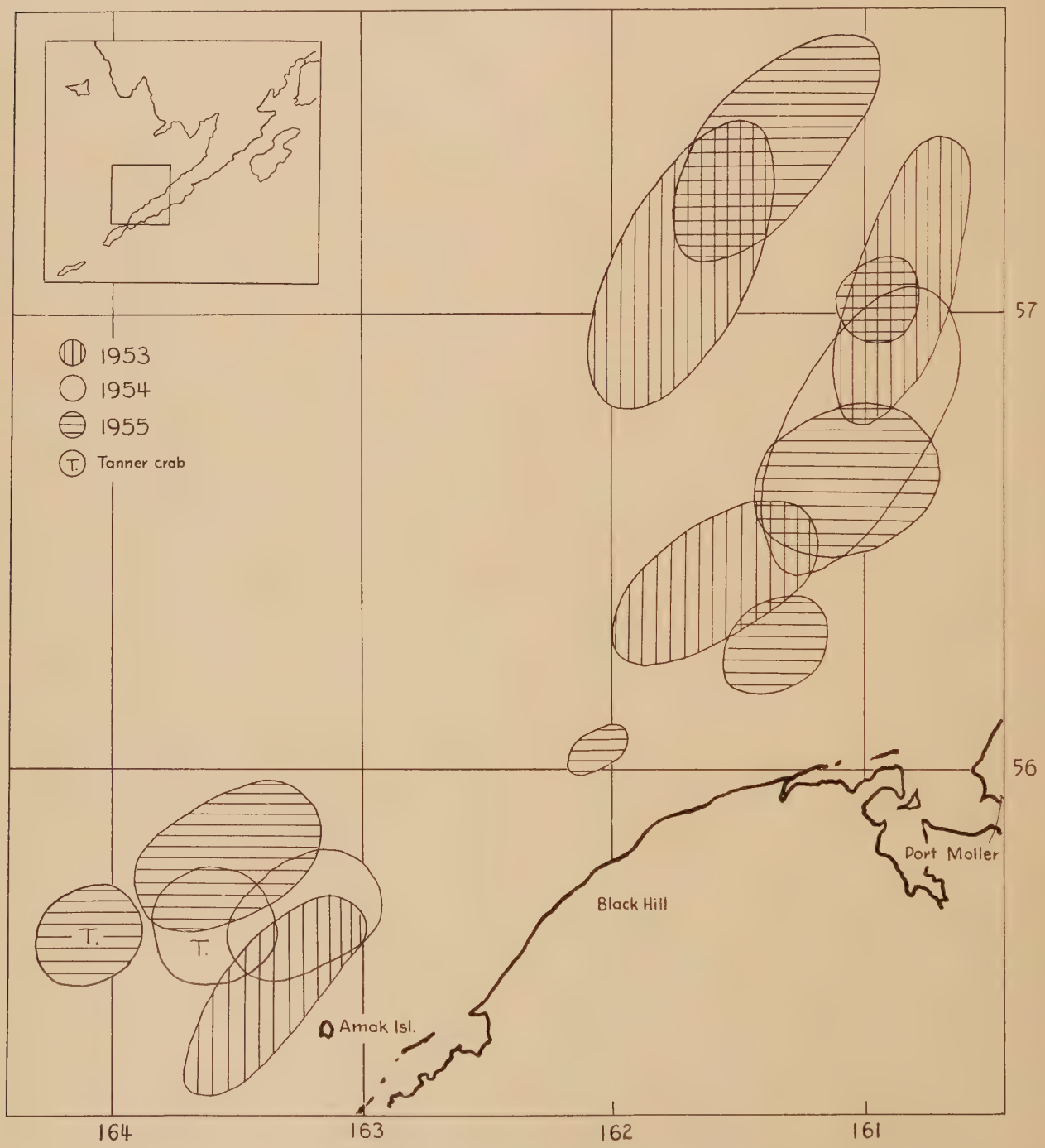


Fig. 1. Main fishing grounds of crab tangle nets, 1953 - 55.

A. Collection and Analysis of Records of Commercial Catches.

1. Records of fishing operations. Records of operations of the mothership and its attached fishing boats were collected during 1953 - 1955. The records from the mothership were as follows: noon position, number of fishing boats operated, number of cans of king crab meat produced, number of crabs per case and number of cans of tanner crabs produced. The following records were obtained from the fishing vessels serving the mothership: location of the fishing area, amount of gear used, time of operation and catch. During 1955 only tangle nets were used, no trawl nets being employed in that year.

The locations of the main fishing grounds during the past three years are shown in Fig. 1. The fishing grounds are divided into four areas: Off Amak Island, Off Black Hill, Near Port Moller and Off Port Moller. In each of these three years, fishing operations began in the area off Amak Island, moved in an east northeast direction along the Alaska Peninsula and ended off Port Moller. In 1954 and 1955 the mothership returned again to the area off Amak Island to catch tanner crabs. The catch by months in 1955 is shown in Table 1.

The king crab and tanner crab production for 1953 and 1954 is shown in Table 2. The catch of tanner crabs is expressed in round numbers since, at the beginning of the season, a few tanner crabs are usually caught together with the king crabs and their number was not accurately recorded. The fishing and canning of tanner crabs took place mainly off Amak Island—the small numbers of tanner crabs caught in other areas were not canned.

2. Composition of the Catch. The sex ratio of the king crabs caught by trawl nets in 1954 was observed at various times aboard a fishing vessel. Results of the observations, including one determination made from tangle net catches, are shown

TABLE 1. Catch of Crabs in the Eastern Part of the Bering Sea, 1955.

Period	No. of "tans"* set	No. days net soaked	No. crabs caught	Crabs per "tan"	No. cases produced**
4/16 - 4/30	11,919	7.53	57,462	4.82	2,691
5/1 - 5/31	26,149	9.46	317,882	12.15	17,577
6/1 - 6/30	26,241	13.77	389,464	14.84	20,311
7/1 - 7/31	34,848	9.95	364,355	10.45	19,271
Total	99,157	10.54	1,129,163	11.38	59,850
Tanner Crab					
8/1 - 8/16	19,724	4.30	160,850	8.15	2,840

* A "tan" is a unit of net. In the case of the king crab fishery a "tan" of crab tangle net measures about 130 feet in length at the lead line.

** 48 cans of ½ lb. each per case.

TABLE 2. Pack by Japanese Crab Mothership in the Eastern Bering Sea.

Year	Total days fished	No. of motherships	No. of king crabs caught	Pack in cases[1]	No. of crabs per case	Tanner crab pack in cases
1953	119	1	1,276,360	58,240	21.9	170
1954	85[2]	1	1,060,814	59,850	17.7	3,457
1955	126[3]	1	1,129,163	59,850	18.9	2,840

1. 48 half-pound cans each.
2. 78 days for king crab fishing.
3. 110 days for king crab fishing.

in Table 3. As the season advanced, the proportion of females increased and that of undersized* males decreased. In the latter half of the season the catches of both male and female crabs, especially of soft-shelled females, increased in the same areas.

not carry old (previous year) eggs. By the end of May more than half of the females had new-laid eggs. By the middle of June all females carried new eggs.

Fertilized eggs were also collected. It was

TABLE 3. Composition of Catch of King Crabs by Trawl Nets, 1954.

Date	No. of hauls	Total number	Catch		
			Male %	Undersized male %	Female %
4/22	4	463	52.5	8.6	38.9
5/17	5	1643	33.5	28.8	37.7
23	Tangle net 15 "tan"	167	37.1	28.1	34.7
27	1	373	27.6	20.9	51.5
31	5	2185	36.5	7.0	56.5
6/7	3	870	34.7	11.4	53.9
14	1	405	36.5	—	63.5
29	2	3725	20.5	—	79.5

The results of fishing by scouting nets in 1955 have been tabulated in Table 4. From this table the proportions of legal-sized males, undersized males, soft-shelled males, females and tanner crabs in the catch can be determined. The data for 1954 (Table 3) were obtained from trawl net catches while the data for 1955 are based on catches by tangle nets; for this reason catches in the two years cannot be compared directly.

difficult to find eggs which had been laid in the previous year after May 18. Eggs laid in 1955 were very frequently observed after June 8.

From the facts mentioned above, the copulation season in 1955 seems to have begun earlier and to have been shorter than in the previous year; it is presumed that the copulation seasons in 1954 and 1955 were as follows: in 1954, from the be-

TABLE 4. Composition of Catch of King Crabs by Tangle Nets, 1955.

Date	No. fishing operations	No. "tan" set	Total number	Catch				
				Male %	Soft-shelled male %	Undersized male %	Female %	Tanner crab %
April	109	538.5	8,312	18.9	1.7	9.0	9.0	61.3
May	219	1077.5	14,798	53.1	2.6	14.3	19.0	11.1
June	268	1340	16,563	60.2	2.2	13.5	16.9	7.2
July	190	935	14,440	36.2	5.0	34.1	19.8	4.9
August	145	717	8,121	13.6	5.3	11.6	7.0	62.7
Total	931	4608	62,234	41.4	3.3	17.6	15.7	22.1

During 1955, in contrast to 1954, while the catch of male crabs increased, that of females decreased. This may be due to the fact that the tangle nets used in 1955 could not catch soft-shelled females. In July 1955, off Port Moller, the proportion of undersized males increased.

3. Copulation Season. Observations were made on the carrying of eggs by female crabs in 1955. A female carrying new eggs was found on May 1. By the middle of May most females did

ginning to the end of June; in 1955, from late May to early June.

B. Identification of Stocks.

The length and width of the carapace and the length of the meropodite of the right third leg were measured on samples collected from crabs landed on the mothership. The average carapace length and width for legal-sized (over 130 mm carapace width) male crabs measured from samples taken aboard the mothership were as follows:

* Under Japanese regulations, the catching of male crabs measuring less than 130 mm. in greatest width of the carapace is prohibited.

Year	Number of crabs measured	Average carapace length (mm.)	Average carapace width (mm.)
1953	4119	170.30	196.97
1954	2877	166.50	196.24*
1955	4500	164.15	194.76

* Based on measurement of 2876 crabs.

The number of crabs per case of 48 - ½ lb. cans was as follows:

1930-39 average	20.2	crabs/case
1953	21.9	"
1954	17.7	"
1955	18.9	"

The change in the number of crabs per case does not correspond with the change in average carapace length. The regression of the carapace length on the number of crabs per case was calculated and no significant difference in the regression lines was found between the post-war years. The number of crabs per case does not always represent the size of the crabs, but is presumed to be influenced by various other factors, such as variations in the canning process and in the condition of the meat of the crabs.

The carapace length distributions throughout 1953, 1954 and 1955 seasons are shown in Fig. 2. A rather symmetrical distribution of carapace lengths was recorded in 1953. In 1954 and 1955 the modes of distribution shifted to somewhat larger values. The same trend was also observed in carapace width measurements.

The difference in carapace size due to the difference in gear, that is, trawl and tangle nets, was not calculated, but the difference due to various areas of fishing was clear; generally, kurtosis was small in the carapace-length distribution in catches made off Amak Island, the mode of the distribution of carapace lengths near Port Moller shifted toward a larger value, and that off Port Moller moved toward a smaller value. In these cases, the change of fishing ground was accompanied by a change of the season. Operations off Amak Island ended during the first or second ten-day periods in May, 1953-54-55. After that the size distribution suddenly moved to a larger value and then gradually shifted to smaller values. This trend was conspicuous in 1953 and 1955. The same tendency was observed for the distribution of carapace widths as well as for carapace lengths.

Calculations were made to determine whether there was any difference by area within a year for the regression of carapace width on carapace length, but no difference was observed. Neither could differences between years be found. Further calculations of the regression of the length of the meropodite of the right third leg on carapace

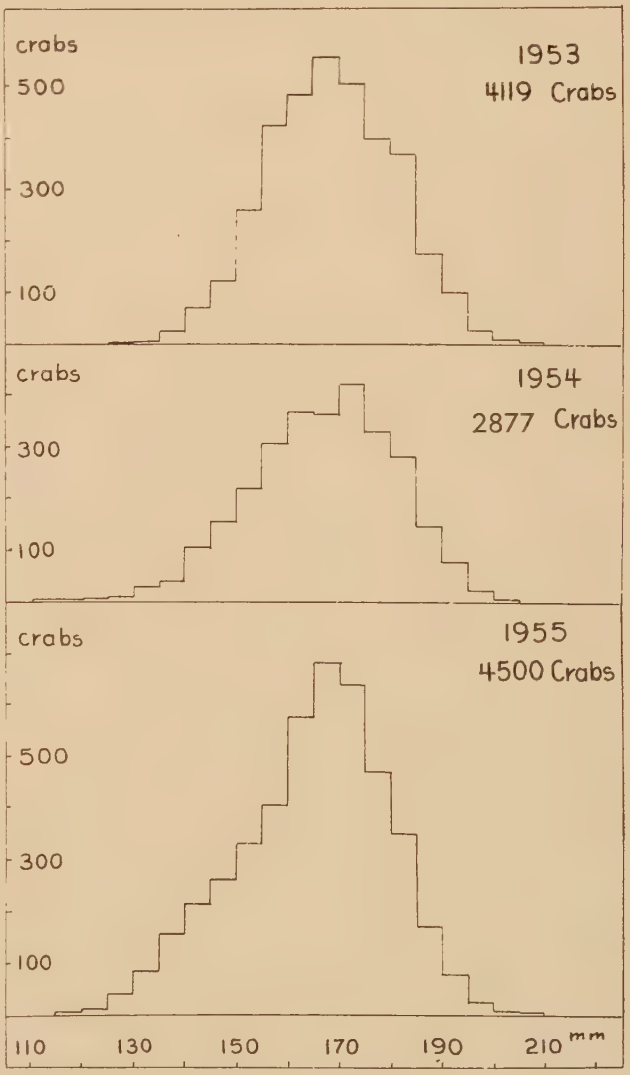


Fig. 2. Carapace length frequencies of male crabs measured aboard the mother ship, 1953 - 55.

length were made for 1955, but no differences were found between areas.

C. Relation of Currents to Distribution and Disposal of Young.

The results of observations of the bottom water temperature and the tidal currents are stated here. Work on identification of plankton samples and determination of salinity of sea water samples is now being conducted.

Bottom water temperatures, shown in Table 5, were observed aboard the mothership *Tokei Maru* at noon each day (western Alaska local time). Generally speaking, as the season advanced, the water temperature rose. Temperatures in 1955 were the highest and those in 1954 the lowest, especially at the beginning and end of the 1954 season.

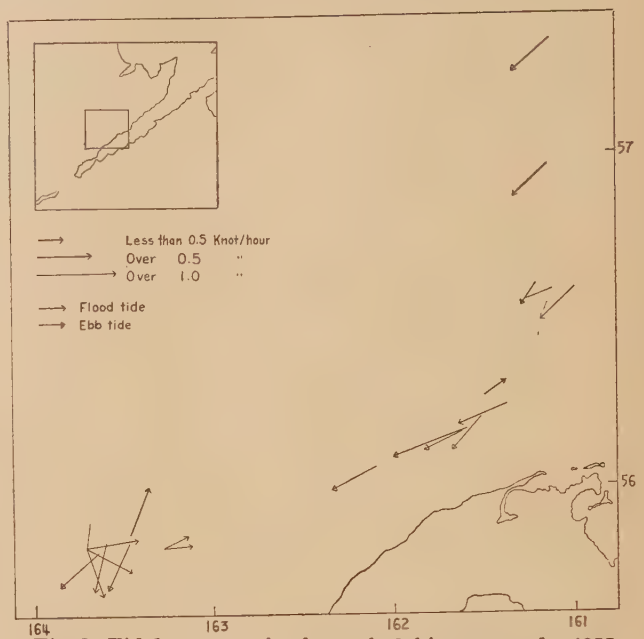


Fig. 3. Tidal currents in the crab fishing grounds, 1955.

TABLE 5. Bottom Water Temperature in the Crab Fishing Grounds, 1953 - 55.

Year	Date	Locality	Average bottom water temperature	Average depth	Number of observations
1953	4/19 - 5/14	(Near Amak Is.)	2.2°C.	67 m.	22
*	5/15 - 5/31	(Off Port Moller)	2.2	68	17
	6/1 - 6/30	(Off Port Moller)	2.8	69	30
	7/1 - 7/31	(Off Port Moller)	3.3	67	31
	8/1 - 8/15	(Off Port Moller)	3.6	71	14
1954	4/19 - 5/13	(Near Amak Is.)	0.80		3
**	5/14 - 5/31	(Off Port Moller)	0.52	67	8
		(Off Port Moller)	2.19	67	4
	7/1 - 7/5	(Off Port Moller)	2.54	67	4
	7/6 - 7/11	(Near Amak Is.)	0.65	82	4
1955	4/13 - 5/6	(Near Amak Is.)	2.52	92	17
**	5/7 - 5/8	(Off Black Hill)	2.49	70	2
	5/9 - 5/31	(Off Port Moller)	2.89	60	12
	6/1 - 6/30	(Off Port Moller)	3.67	69	16
	7/1 - 7/31	(Off Port Moller)	4.13	60	19
	8/1 - 8/15	(Near Amak Is.)	4.07	93	9

* Source: Nippon Suisan Company.
** Source: Fisheries Agency of Japan.

The ebb tide usually flowed toward the west southwest (true direction) and the flood tide went toward the east northeast. The time of change of currents on the fishing grounds lagged about three hours behind Port Moller, but the exact value of the lag was not known. This rule did not apply to all occasions in the area off Amak. The highest velocity of the currents did not exceed 1.5 knots. Observations near the coast of the Alaska Peninsula were disturbed by the entanglement of many jelly fish in the current meter. Figure 3 shows the results of current observations made at noon.

E. Study of Movements by Tagging.

An oblong-shaped tag made of red celluloid has been used since 1954. This tag was fastened with gilded-silver wire through the muscle between the carapace and the abdomen. A similar tag was also fastened to the leg.

During 1954, 31 male, 261 female and 89 undersized male crabs were tagged and released and during the same season 2 tagged males and 7

tagged females were recovered. In 1955, 46 male and 7 undersized male crabs were tagged and released. Five tagged male crabs released during 1955 and two tagged male crabs released during 1954 were recovered during 1955. The latter two crabs were recovered, unmoulted, 359 and 379 days, respectively, after release. Figure 4 shows the movement of tagged crabs. Since there were only a few recoveries, no definite pattern of movement can be observed.

Research on the rate of growth and age determination of king crabs and determination of fishing and natural mortalities (Items D and F of the Commission's program, respectively) has not yet reached a stage that will allow submission of an interim report.

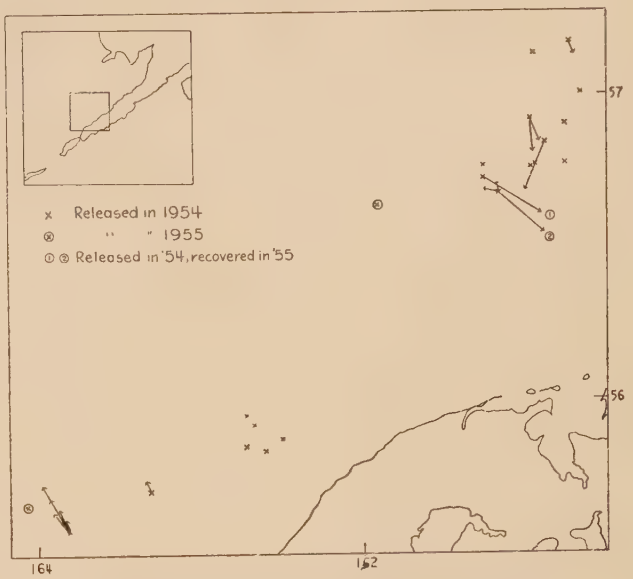


Fig. 4. Movements of tagged crabs, 1954 - 55.

C. REPORT ON THE INVESTIGATIONS BY THE UNITED STATES FOR THE INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION, 1955

Before beginning their part of the Commission's research program, certain agencies of the United States completed work basic to planning for the present studies.

The U. S. Fish and Wildlife Service and the Fisheries Research Institute of the University of Washington made an examination of the literature and initiated compilation of a salmon bibliography.* The Department of Oceanography of the University of Washington prepared a review of the oceanography of the North Pacific (Fleming, 1955). United States scientists, at the invitation of the Japanese Governent collected valuable biological information on the distribution and composition of the high seas salmon and crab stocks aboard Japanese motherships, catcher boats and research vessels, (Atkinson, 1954; Fukuhara, 1953, 1955; Miyahara, 1954). In 1953 the exploratory fishing vessel of the U. S. Fish and Wildlife Service, the *John N. Cobb,* operated south of the Aleutians to develop methods of catching salmon on the high seas, as well as to determine the availability of salmon for future biological experiments (Schaefers and Fukuhara, 1954). In addition, United States agencies prepared informal reports for distribution to members of the biological and research committee of the Commission for their reference and study.

The present intensive research program under the supervision of C. E. Atkinson, Chief, Pacific Salmon Investigations of the U. S. Fish and Wildlife Service, began in May, 1955.

Although the Fish and Wildlife Service administers the program as an agency of the United States Government, about 40 percent of the research has been contracted to other agencies. Two major phases of the research program are being done by the University of Washington. Studies on the movement and migration of salmon in the ocean are being made by the Fisheries Research Institute under the direction of Dr. W. F. Thompson. The relation of oceanographic conditions to salmon distribution is being investigated by Dr. Richard H. Fleming and the staff of the Department of Oceanography.

The Fish and Wildlife Service has employed its own existing specialized units to carry out certain parts of the program. Thus, the operation of the *John N. Cobb* is under the direction of D. E. Powell, Chief, North Pacific Fisheries Exploration and Gear Research; the physiological studies are under the direction of J. E. Halver, Chief, Salmon Nutrition Laboratory, Willard, Washington; and the parasitological studies are under the direction of R. R. Rucker, Chief of the Western Disease Laboratory.

Nearly every aspect of the formal program as outlined to the Commission has been fulfilled.

SALMON INVESTIGATIONS

Offshore Distribution of Salmon.

The U. S. Fish and Wildlife Service vessel *John N. Cobb* (Table 1), has fished throughout the Gulf of Alaska at the 34 stations shown in Fig. 1. Using a little more than a mile of gill net as a standard set, the vessel has made catches as high as 168 salmon per set. All five species of salmon have been taken. Although chum, pink, red and silver salmon were taken in significant numbers, kings or chinooks were caught only occasionally. Table 2 is a summary of the catches made by the *Cobb* from June 25 through August 30, 1955. Salmon were caught at every station, even though the vessel fished over a very wide area.

TABLE 1. Specifications of the Vessels Used for Study of the Offshore Distribution of Salmon.

Vessel	Type	Registered Length	Breadth	Cruising Range	Speed
John N. Cobb	Seiner	93.0	25.0′	5000	10
Mitkof	Schooner	66.1	18.4′	3600	9
Paragon	Schooner	80.1	19.5′	4000	8.5

* A working bibliography has been distributed to the Commission and its research agencies.

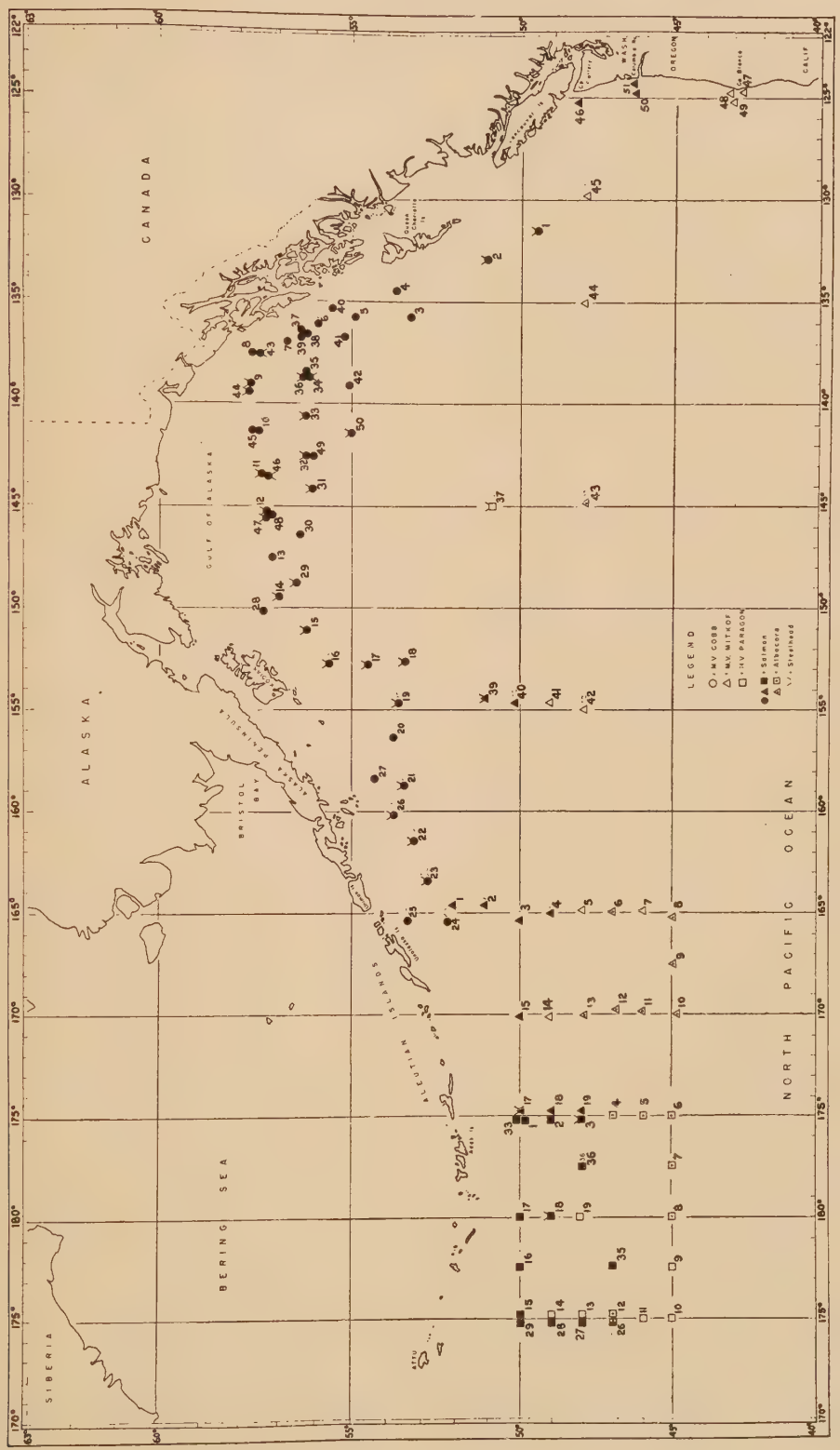


Fig. 1. Stations Fished by United States Research Vessels, 1955.

TABLE 2. Summary of the Catches of Salmon taken by the vessel John N. Cobb, June to September, 1955.

Date	Station No.	Lat. N.	Long. W.	Species Red	Pink	Chum	Silver	King	Total
June 25	1	49°-30′	131°-35′	3	1	1	—	—	5
June 26	2	51°-00′	132°-45′	6	1	1	1	—	9
June 30	4	53°-20′	135°-40′	—	1	1	1	—	3
July 1	5	54°-05′	134°-45′	1	—	1	1	—	3
July 2	6	54°-55′	135°-45′	7	5	15	16	—	43
July 3	7	55°-55′	136°-10′	10	9	7	24	—	50
July 6	8	56°-45′	137°-00′	3	6	3	69	—	81
July 7	9	57°-40′	137°-40′	14	6	7	6	—	33
July 11	10	57°-45′	139°-25′	32	29	47	17	—	125
July 12	11	57°-35′	141°-25′	13	32	35	6	—	86
July 13	12	57°-25′	143°-30′	21	57	49	2	—	129
July 14	13	57°-15′	145°-30′	2	4	1	1	—	8
July 16	14	57°-10′	147°-30′	1	—	6	—	—	7
July 17	15	57°-00′	149°-35′	16	40	70	6	3	135
July 18	16	56°-10′	151°-00′	10	20	63	2	1	96
July 21	17	55°-40′	152°-40′	8	10	10	6	—	34
July 22	18	54°-35′	152°-40′	6	7	16	2	1	32
July 23	19	53°-25′	152°-35′	9	9	9	2	1	30
July 24	45	53°-25′	155°-20′	5	6	6	—	2	19
July 25	46	53°-25′	157°-25′	22	7	18	2	—	49
July 26	47	53°-25′	159°-30′	7	—	1	—	—	8
July 30	48	53°-10′	161°-30′	20	2	9	1	—	32
July 31	49	52°-45′	163°-30′	6	2	3	5	—	16
Aug. 1	50	52°-15′	165°-25′	18	—	14	—	—	32
Aug. 2	51	53°-20′	165°-25′	50	8	11	2	2	73
Aug. 4	53	53°-50′	161°-00′	21	—	69	4	1	95
Aug. 5	54	54°-05′	158°-55′	11	2	1	—	—	14
Aug. 9	near 15*	57°-00′	149°-35′	4	32	84	25	4	149
Aug. 10	near 26*	56°-20′	148°-25′	13	7	54	3	—	77
Aug. 11	27	56°-25′	146°-20′	1	—	—	—	—	1
Aug. 16	28	56°-05′	144°-30′	2	1	10	1	—	14
Aug. 17	29	56°-15′	142°-35′	12	10	19	—	—	41
Aug. 18	30	56°-15′	140°-40′	—	16	37	2	—	55
Aug. 19	31	56°-15′	138°-45′	3	37	87	1	1	129
Aug. 20	31	(Daylight set)		1	11	11	—	—	23
Aug. 20	31			—	28	16	1	—	45
Aug. 21	32	56°-20′	136°-40′	2	138	28	—	—	168
Aug. 22	32	(Daylight set)		—	5	4	—	—	9
Aug. 22	32			—	72	11	1	—	84
Aug. 26	33	55°-30′	135°-15′	—	13	8	1	—	22
Aug. 29	34	55°-00′	137°-10′	—	1	46	—	—	47
Aug. 30	35	55°-00′	139°-20′	—	—	36	—	—	36
Totals				360	635	927	211	16	2,147

* Exact location not yet available.

To study the aboundance and distribution of salmon around the provisional abstention boundary (175°W.) the Service chartered two vessels, the *Mitkof* and the *Paragon* (Table 1) to fish south of the Aleutians during the month of August. Both chartered vessels carry a crew of six fishermen, two biologists and an oceanographer. The station pattern for these two vessels covers an area between 175°E. and 165°W. longitude and from the Aleutians south to 45°N. latitude (Fig. 1). Duplicate observations at three of the five series of stations provide information on shifts in the abundance of salmon within and between stations.

Tables 3 and 4 give the numbers of salmon taken at each of the stations in the Aleutian Area. Fishing in August provided an indication of the size, composition and distribution of the immature salmon stocks present in the area in late summer. Pink salmon *(O. gorbuscha)* which mature uniformly at two years of age were totally absent from the catches.

Identification of Stocks.

The United States began an intensive collection of salmon and salmon measurements from the North American coast, the high seas, and certain Asian waters for racial analysis. The total

Fig. 2. Salmon charter vessel "*Mitkof*."

TABLE 3. Summary of the Catches of Salmon and Albacore by the Mitkof, 1955.

Date	Station	Location		Red	Pink	Chum	Silver	King	Total	Albacore
		Latitude	Longitude							
Aug. 12	1	52°00′N.	165°00′W.	22	—	31	—	—	53	—
13	2	51°00′N.	"	41	—	16	—	—	57	—
14	3	50°00′N.	"	3	—	16	—	—	19	—
15	4	49°00′N.	"	1	—	2	—	—	3	—
16	5	48°00′N.	"	—	—	—	—	—	0	—
17	6	47°00′N.	"	—	—	—	—	—	0	3
18	7	46°00′N.	"	—	—	—	—	—	0	—
19	8	45°00′N.	"	—	—	—	—	—	0	3
20	9	45°00′N.	167°30′W.	—	—	—	—	—	0	21
21	10	45°00′N.	170°00′W.	—	—	—	—	—	0	18
22	11	46°00′N.	"	—	—	—	—	—	0	4
23	12	47°00′N.	"	—	—	—	—	—	0	2
24	13	49°00′N.	"	—	—	—	—	—	0	1
25	14	50°00′N.	"	—	—	—	—	—	0	—
26	15	51°00′N.	"	5	—	3	—	—	8	—
Sept. 3	17	50°00′N.	175°00′W.	22	—	7	—	1	30	—
4	18	49°00′N.	175°06′W.	4	—	1	—	—	5	—
7	19	48°00′N.	175°00′W.	4	—	12	—	—	16	—
22	39	51°03′N.	154°35′W.	10	—	2	—	1	13	—
23	40	50°05′N.	154°42′W.	10	—	2	1	—	13	—
24	41	49°02′N.	154°42′W.	—	—	—	—	—	0	—
25	42	47°57′N.	155°00′W.	—	—	—	—	—	0	—
28	43	47°57′N.	144°52′W.	—	—	—	—	—	0	1
Oct. 1	44	45°57′N.	135°00′W.	—	—	—	—	—	0	—
3	45	47°56′N.	129°52′W.	—	—	—	—	—	0	—
5	46	48°08′N.	125°27′W.	—	—	2	12	1	15	—
17	47	42°41′N.	124°41′W.	—	—	—	—	—	0	—
18	48	43°07′N.	124°31′W.	—	—	—	—	—	0	—
18	49a	42°59′N.	125°02′W.	—	—	—	—	—	0	—
19	49b	42°59′30″N.	125°02′W.	—	—	—	—	—	0	—
22	50	45°28′30″N.	124°25′30″W.	—	—	—	—	1	1	—
23	51	46°29′30″N.	124°10′W.	—	—	—	2	—	2	—
Total				122	0	94	15	4	235	53

number of fish in samples taken in 1955 are given in Table 5. Even with the wide distribution and quantity of samples, we were unable to collect all of the specimens originally planned; for example, we have had to confine our samples to the three species (red, pink and chum salmon) which are most important to the Commission's problems. Only an occasional chinook or silver salmon was examined.

Biologists have now completed analysis of the morphometric and meristic characters for over 3,330 red salmon collected from the Okhotsk Sea,

TABLE 4. Summary of the Catches of Salmon and Albacore by the Paragon, 1955.

Date	Station	Location		Red	Pink	Chum	Silver	King	Total	Albacore
		Latitude	Longitude							
Aug. 13	1	50°00′N.	175°00′W.	30	—	11	1	11	53	—
14	2	49°00′N.	"	2	—	15	—	—	17	—
15	3	48°00′N.	"	3	—	8	—	—	11	—
16	4	47°00′N.	"	—	—	—	—	—	0	8
17	5	46°00′N.	"	—	—	—	—	—	0	41
18	6	45°00′N.	"	—	—	—	—	—	0	18
19	7	"	177°30′W.	—	—	—	—	—	0	87
20	8	"	180°00′	—	—	—	—	—	0	1
21	9	"	177°30′E.	—	—	—	—	—	0	—
22	10	"	175°00′E.	—	—	—	—	—	0	—
23	11	46°00′N.	"	—	—	—	—	—	0	—
24	12	47°00′N.	"	—	—	—	—	—	0	1
25	13	48°00′N.	"	—	—	—	—	—	0	—
26	14	49°00′N.	"	—	—	—	—	—	0	—
27	15	50°00′N.	"	1	—	33	—	—	34	—
28	16	50°00′N.	177°30′E.	11	—	59	—	—	70	—
Sept. 3	17	50°00′N.	180°00′	16	—	111	—	—	127	—
4	18	49°00′N.	180°00′	6	—	91	—	—	97	—
7	19	48°00′N.	180°00′	Net torn loose in heavy seas—No catch						—
13	29	50°00′N.	175°00′E.	4	—	33	—	—	37	—
14	28	49°00′N.	174°55′E.	—	—	47	—	—	47	—
15	27	47°38′N.	174°49′E.	—	—	3	—	—	3	—
16	26	47°00′N.	175°00′E.	—	—	13	—	—	13	1
17	35	47°00′N.	177°30′E.	—	—	2	—	—	2	—
19	36	48°00′N.	177°30′W.	—	—	30	—	—	30	—
20	33	50°00′N.	175°00′W.	3	—	14	—	—	17	—
Oct. 3	37	51°00′N.	145°00′W.	—	—	—	—	—	0	—
Total				76	—	470	1	11	558	157

Eastern Pacific, Western Aleutians, and fourteen areas along the North American Coast. A total of 49 items (Table 6) are being recorded from each fish with the resulting information placed upon IBM cards for machine analysis. The preliminary results are most promising.

Table 6 — List of Characters Under Study

Meristic Characters.

1. No. of scales on lateral line.
2. No. of rows of scales above lateral line.
3. No. of rows of scales below lateral line.
4. No. of branchiostegal rays.
5. No. of gill rakers on dorsal limb of 1st left gill arch.
6. No. of gill rakers on ventral limb of 1st left gill arch.
7. Total no. of gill rakers on 1st left gill arch.
8. No. of pectoral fin rays.
9. No. of anal fin rays.
10. No. of pelvic fin rays.
11. No. of dorsal fin rays.
12. No. of abdominal vertebrae.
13. No. of caudal vertebrae.
14. Total no. of vertebrae.
15. Position of 1st complete haemal arch.
16. No. of pyloric caecae.

Morphometric Characteristics (measurements in millimeters).

17. Interorbital width.
18. Greatest depth anterior to dorsal fin and perpendicular to lateral line.
19. Depth of body at vent taken perpendicular to lateral line.
20. Distance between fork of tail to end of hypural plate.
21. Distance between end of hypural plate and mideye.
22. Distance between mideye and tip of snout.
23. Distance between mideye and insertion of dorsal fin.
24. Distance between mideye and insertion of pelvic fin.
25. Distance between mideye and insertion of anal fin.
26. Distance between posterior end of dorsal fin and insertion of adipose fin.
27. Length of dorsal fin base.
28. Length of anal fin base.
29. Distance between fork of tail and mideye.
30. Distance between fork of tail and tip of snout.

TABLE 5. Numbers of Salmon Measurements, Preserved Specimens and Scale Samples for 1955 Field Season.

Locality	Reds			Pinks			Chums			Silvers			Kings		
	Meas.	Spec.	Scales	Meas.	Spec.	Scales	Meas.	Spec.	Scales	Meas.	Spec.	Scales	Meas.	Spec.	Scales
Alaska Peninsula															
Chignik	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—
King Cove	520	117	520	349	130	349	430	140	430	146	—	146	—	—	—
Aleutian Islands															
Adak	53	13	53	16	—	16	—	—	—	6	—	6	—	—	—
Attu	610	52	610	120	67	120	—	—	—	—	—	—	—	—	—
Unalaska	—	5	—	—	90	—	—	—	—	—	—	—	—	—	—
Area N. of Bristol Bay															
Kuskokwim River	24	3	24				301	10	301	—	11	—	41	1	41
Yukon River	—	1	—	12	1	12	475	18	475	62	6	62	6	1	6
Unalakleet River	—	—	—	34	10	34	386	16	386	124	6	124	—	—	—
Nome River	—	—	—	—	—	—	—	10	—	—	—	—	—	1	—
Grantley Harbour	19	4	19	9	1	9	30	7	30	—	2	—	—	—	—
Kotzebue Sound	1	—	1	—	—	—	367	12	367	—	—	—	—	—	—
Bristol Bay															
Egegik															
Commercial Fishery	2478*	100	1912	—	—	—	—	—	—	—	—	—	—	—	—
Kvichak-Naknek															
Commercial Fishery	4613*	100	2930**	—	—	—	—	—	—	—	—	—	—	—	—
Igiugig	2073*	—	2013*	—	—	—	—	—	—	—	—	—	—	—	—
Naknek Weir	716*	50	1026**	—	—	—	—	—	—	—	—	—	—	—	—
Brooks Lake	2990	—	970	—	—	—	—	—	—	—	—	—	—	—	—
Nushagak															
Commercial Fishery	3674*	—	1921**	—	—	—	—	—	—	—	—	—	—	—	—
Spawning Ground	7139*	15	3353*	—	—	—	—	—	—	—	—	—	—	—	—
Togiak															
Commercial Fishery	379*	—	190*	—	—	—	—	—	—	—	—	—	—	—	—
Ugashik															
Commercial Fishery	906*	100	906**	—	—	—	—	—	—	—	—	—	—	—	—
Weir	1462**	—		—	—	—	—	—	—	—	—	—	—	—	—
Canada															
Adams River	—	60	—	—	—	—	—	—	—	—	—	—	—	—	—
Cultus Lake	—	60	—	—	—	—	—	—	—	—	—	—	—	—	—
Fraser River	800	200	800	531	279	531	398	202	398	—	—	—	—	—	—
Skeena River	505	150	505	500	125	500	100	50	100	—	—	—	—	—	—
Rivers Inlet	220	114	220	162	10	142	400	60	100	—	—	—	—	—	—
Central Alaska															
Copper River	—	200	498	—	—	—	—	—	—	—	—	—	—	—	—
Pr. Wm. Sound*	—	—	—	254	—	—	91	—	57	—	—	—	—	—	—
Columbia River	277	75	277	—	—	—	—	—	—	—	—	—	—	—	—
Cook Inlet															
Anchorage	460	100	460	—	—	—	40	25	40	240	75	240	—	—	—
Seldovia	696	100	696	513	50	513	280	50	280	80	—	80	138	—	138
Japanese High Seas															
North Pacific Fishery	902	399	902	19	385	19	673	425	673	—	—	—	—	—	—
Sea of Okhotsk	100	125	—	—	125	—	—	100	—	—	25	—	—	—	—
Kodiak Island															
Alitak Bay	423	50	423	425	50	425	414	—	414	—	—	—	—	—	—
Bare Lake	421	—	421	—	—	—	—	—	—	—	—	—	—	—	—
Karluk Weir	2353	200	1867	—	—	—	—	—	—	—	—	—	—	—	—
Karluk Lake Spawning Gr.	1807	—	509	—	—	—	—	—	—	—	—	—	—	—	—
Kodiak Fishery	2252*	—	1191	836	—	410	600	—	369	—	—	—	—	—	—
Larsen Bay	376	50	120	439	50	240	228	—	153	—	—	—	—	—	—
Red River Weir	—	60	—	—	—	—	—	—	—	—	—	—	—	—	—
Puget Sound															
La Conner	—	—	—	392	100	392	—	—	—	—	—	—	—	—	—
Samish River	—	—	—	—	—	—	—	48	—	—	—	—	—	—	—
Southeastern Alaska															
Ketchikan	1319	150	1319	503	154	503	1003	160	1003	80	4	80	—	—	—
Petersburg	600	125	600	1652	225	1652	1709	225	1709	—	—	—	—	—	—
John N. Cobb	72†	291	72†	63†	720	63†	91†	1070	91†	52†	169	52†	3†	10	3†
Mitkof	114	92	114	—	—	—	89	81	89	13	13	13	3	3	3
Paragon	76	76	76	—	—	—	468	468	468	1	1	1	11	11	11
Memento	168	—	168	422	—	422	167	—	167	151	—	151	24	—	24
Starling	130	—	130	35	—	35	9	—	9	81	—	81	191	—	191
TOTALS	41728	3287	27816	7286	2572	6387	8749	3177	8109	1036	312	1036	417	27	417

* Samples from Fisheries Research Institute.
** FWS and Fisheries Research Institute samples.
† Measurements and scales from tagged fish.
Note: Scale samples and measurements are available from the frozen samples.

Total No. of Frozen Samples: 9,375
Total No. of Measurements: 59,216
Total No. of Scale Samples: 43,765

Table 6.—(Continued).

Other Related Information.

31. Weight of whole specimen to the nearest decagram.
32. Sex of fish.
33. Volumetric measurement of gonads to the nearest milliliter.
34. Diameter of eggs to the nearest millimeter.
35. Freshwater age.
36. Ocean age.
37. Total age.

Scale Characters.

38. Scale nuclear type (freshwater growth type).
39. No. of circuli in the 1st freshwater zone.
40. No. of circuli in the 2nd freshwater zone.
41. No. of circuli in the intermediate growth zone.
42. Size of scale to end of 2nd winter.
43. Size of scale to end of 3rd winter.
44. Size of scale to end of 4th winter.
45. Size of scale to end of 5th winter.
46. Size of scale to end of 6th winter.
47. Size of scale to end of 7th winter.
48. Size of scale to end of intermediate growth zone.
49. Size of scale to edge of scale.

Scale analysis, although limited, appears to confirm these results. The most interesting information has been from a comparison of circuli counts during the first year's growth. Although these counts would be expected to fluctuate from year to year, yet the Asian fish of the one age group studied had a decidedly lower circuli count than for any of the red salmon examined from the North American waters.

The distribution of parasites in chum salmon showed a very striking difference between Asian and North American stocks. Of particular value are two intestinal parasites: *Echinorhynchus gadi* which is found only on the Asian side of the Pacific and *Tubulovesicula sp.* which occurred only in the North American samples. This distribution has been verified by Canadian researchers working on red salmon taken from the same areas. Here, then, may be "living tags" which can be used to distinguish the stocks and thereby define the distribution limits for Asian and North American salmon.

With some indication of success, although not as far advanced, are the studies on use of blood and blood types to identify the different stocks.

Study of Movements by Tagging.

The first season's work on the deep sea tagging may be summarized under the four headings below:

1. Tag Testing Experiments.

An important initial step in the tagging work is the testing of various types of tags on trout which are being held in ponds for observation. This must be continued over a period of time for conclusive results, but the tests already have suggested improvements and modifications which were incorporated in the field tagging.

It has been shown that the tag injuries heal and that pigmented tissue forms in the puncture made for the plastic tube tags. The puncture heals well with the vinyl tag, and is kept open and gets progressively worse with the disc tag. Attachment of the tags on the gill cover was not successful. Tag cylinders attached with monofilament nylon pull out and are lost. A new plastic, which is very soft, called " Ivyflex," is superior and more easily tied.

2. Methods of Handling Fish for Tagging.

These received much attention as probably of the greatest importance to the survival of the tagged fish. It has already been shown that gill-netted fish are not in good condition for tagging and that purse-seined fish are superior, especially as regards red and pink salmon. For purse-seine operations a special brailer has been devised having a canvas bucket holding over 100 gallons. The fish brailed will be held in these buckets on deck, set in frames, and supplied with circulating water. If more fish are taken than can be thus handled, the surplus will be held in deck tanks of about 1200 gallons capacity with rapidly renewed water. To assure the practical nature of the experiment, the choice of tagging vessel and crew has been done through a committee of vessel owners and fishermen.

3. Preliminary Tagging Aboard the *John N. Cobb* (May 2 - 13)

Fisheries Research Institute personnel were afforded the opportunity of accompanying the

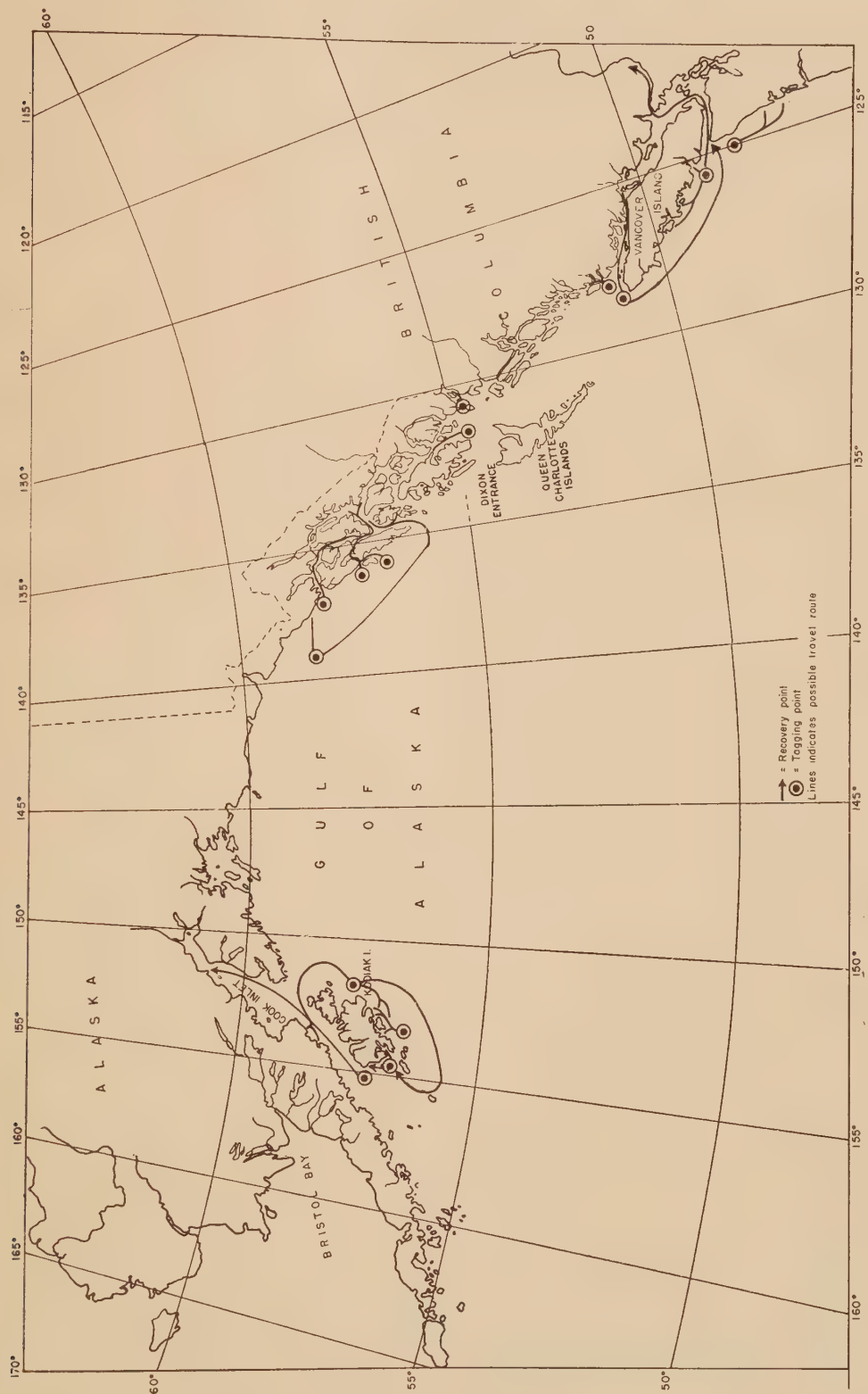


Fig. 3. Tagging Recoveries — "Starling" and "Memento" — 1955.

John N. Cobb on an experimental cruise off Swiftsure banks in which valuable experience was gained in testing our tags, equipment and methods under field conditions, which aided in planning the charter-boat tagging.

A total of 103 salmon were tagged as follows:

Tables 9, 10 and 11 summarize the recoveries to May, 1956 by species, by gear used for tagging, and by type of tag.

In addition to those tagged, a total of 737 salmon of all species were retained for examination as to maturity and stomach content. At this

TABLE 7. Summary of Tags Released by John N. Cobb in Experimental Studies.

Reds	1		
Cohos	15		
Kings	86	Disc tags	43
Steelhead	1	Tube tags	60
	103		103

19 caught by gill net.
84 caught by trolling.
A total of 14 of these have been recovered to date, giving a recovery of about 13.6 per cent.

4. *Memento* and *Starling* Experiments (June and and July).

Two seine boats equipped as shown in the table below were chartered for June and July for seeking and tagging fish just outside of present fishery areas.

early date the following tentative conclusions may be drawn:

Large areas containing feeding salmon of all five species may be found along most of the offshore grounds where fishing was conducted.

Red salmon were frequently found to be empty

TABLE 8. Specifications of vessels Memento and Starling.

						Gill Nets			
	Length	Crew	Seine Length	Seine Depth	Mesh Size	4 in. Nylon	4½ in. Nylon	5 in. Nylon	5½ in. Linen
Memento (reel seiner)	57 ft.	4	260 fm.	4½ strip	4½ in.	100 fm.	50 fm.	100 fm.	100 fm.
Starling (reel seiner)	64 ft.	4	265 fm.	5½ strip	4¼ in.	50 fm.	100 fm.	50 fm.	100 fm.

Seines were chosen as the primary gear, since fish caught by this method are in good condition to tag, but various types of gear were carried and tried.

Figure 3 shows the tagging locations for the *Memento* and the *Starling* together with the distribution of recoveries through August 25. In planning these, locations were chosen which were on the one hand outside commercial fishing areas and prior to seasons, so that the numerous estuarial tagging experiments would not simply be repeated, and on the other hand, not too far at sea, so that the deep-sea work of the *John N. Cobb* would not be duplicated. This meant that catches would be smaller and returns of tags intermediate. This was anticipated and the small catches and low rate of return are the answers sought and are not failures on the part of the crews or the methods used.

and with contracted stomachs as contrasted with the other four species, all of which were full of feed, in most cases. This perhaps indicates that a larger share of the reds range farther offshore than do the others and were already beginning their inshore migration.

Chums and kings were the only species found to be immature, (approximately 20% of the chums and 80% of the kings were immature, as evidenced by gonad size, and may be expected to spend at least one winter at sea).

From Tables 9, 10 and 11, it may be observed that:

(1) In Table 9 the recovery of about 13% of salmon tagged just prior to, and just outside the coastal fishery areas, is in sharp contrast to the 0.9 percent recovery of salmon tagged in the

TABLE 9. Summary of Tag Recoveries.

Memento and Starling Tagging Experiments						
	Red	Chum	Pink	Silver	King	Totals
Number tagged	258	176	457	232	215	1,378
Number recovered	47	9	68	35	22	181
Percent recovered	18.2	5.1	14.7	15.1	10.2	13.1

Tagged by John N. Cobb	
In Gulf of Alaska and westward from June 26 to August 23	331
Recovered	3
Percentage Recovered	0.9

TABLE 10. Recoveries by Gear Used in Tagging by Memento and Starling.

	Red	Chum	Pink	Silver	King	Total
Purse Seine						
Tagged	117	121	372	230	211	1,051
Recovered	31	5	60	35	21	152
% Recovered	26.5	4.1	16.1	15.2	10.0	14.5
Gill Net						
Tagged	181	55	85	1	1	323
Recovered	16	4	8	—	—	28
% Recovered	8.8	7.3	9.4	—	—	8.7
Troll						
Tagged	—	—	—	1	3	4
Recovered	—	—	—	—	1	1
% Recovered	—	—	—	—	33.3	25.0

TABLE 11. Recoveries by Type of Tag Used by Memento and Starling (all species).

Petersen Disc		Plastic Tube	
Tagged	604	Tagged	775
Recovered	83	Recovered	98
% Recovered	13.7	% Recovered	12.6

Gulf of Alaska and westward, and to the lack of recoveries of salmon which have been tagged on the high seas by other agencies.

Both of these percentages are dwarfed by the 40 to 50% returns from experiments which have been done off the rivers into which the salmon are migrating and during commercial fishing operations there. This indicates that as tagging locations are further removed from the inshore fisheries, and over deeper water, the recoveries diminish rapidly.

(2) Table 10 indicates that superior results may be expected from tagging seine-caught reds and pinks as compared to gill-net caught fish. More data are desirable from the several species, but it would appear that chums caught by seine show no superiority. This is one of the several reasons which will necessitate a type of high seas tagging operation distinct from that used in exploration alone, which depends on gill nets.

(3) The plastic tube tags, as far as our preliminary work is concerned, are at least as good as, if not better than, the discs (Table 11) on mature salmon. They are expected to prove definitely superior in the case of immatures, hence merit adoption where immatures become of prime importance, as is expected in future tagging operations.

Oceanography.

In order to carry on oceanographic investigations concurrently with the exploratory salmon fishing on the *John N. Cobb,* the U. S. Fish and Wildlife Service negotiated a small contract with the Department of Oceanography of the University of Washington. Certain equipment and personnel were provided during the period June - September, 1955.

Somewhat similar work was undertaken on the *Mitkof* and *Paragon* with limited facilities and equipment by personnel of the U. S. Fish and Wildlife Service, following procedures recommended by the Department of Oceanography. Work done on the *Cobb, Mitkof,* and *Paragon* is described in the report from the Department of Oceanography (Gast, Amidon, Hebard and Selinger, 1956).

Oceanographic observations were limited to bathythermograph measurements at each fishing station and at intermediate points, a few water samples at depths down to 500 or 1000 meters and to vertical tows with half-meter plankton nets. Dissolved oxygen and phosphate determinations were made on the *John N. Cobb.*

A data report based on the above programs is being assembled.

contents of sockeye salmon caught in the Japanese fishery. Similar studies will be made of the stomachs of salmon caught by the U. S. Fish and Wildlife Service. Preliminary results indicated that the organisms common in the stomachs of the plankton-feeding salmon were not well represented in the plankton samples.

Japanese reports indicate that the bulk of the salmon caught in their high seas fisheries are taken when surface temperatures are between 4° and 9°C. with practically none caught when the temperatures are below 1°C. or above 13°C. Operations of the U. S. exploratory vessels in 1955 were conducted fairly late in the season and in areas where the temperatures were towards the upper portion of the range reported by the Japanese, and south of the Aleutian Islands no salmon were caught at locations where the temperatures exceeded 11°C.

TABLE 12. Summary of Observations—1955.

	John N. Cobb	Mitkof	Paragon	Total
Oceanographic Stations	43	18	26	87
Salinity Analyses	463	168	174	805
O_2 and PO_4 Analyses	340 each	—	—	340 each
Zooplankton Samples	28	17	48	93
Phytoplankton Samples	—	68	52	120
Bathythermograph Obs.	127	50	95	272

A fortunate coincidence in 1955 was the international co-operative study of the Pacific Ocean north of 20° conducted during the period July - September and known as Operation NORPAC. Although none of the field work was supported under the Fish and Wildlife contract the information collected by certain Japanese, Canadian and U. S. vessels provided a comprehensive and synoptic picture of the oceanography of the area of interest to the Commission. Data collected by the *Brown Bear* have been analyzed and compiled by personnel employed on the contract. The data report of the *Brown Bear* was issued as a joint report of the Office of Naval Research, U. S. Fish and Wildlife Service, and the Fish Commission of Oregon, all of whom provided financial support (Fleming, et al, 1956).

Investigations of the food organisms (plankton) are being actively pursued, as well as studies of the stomach contents of the salmon. One report (Allen, 1956) has been issued on the stomach

Preliminary results indicate that the water conditions on the two sides of the Northern Pacific are markedly different. The Asiatic side is one of contrasts, being colder in winter than in corresponding latitudes on the American side, particularly in the Gulf of Alaska. The range in temperature at any time of the year is also greater on the Asiatic side because of the warm water introduced by the Kuroshio and the cold water carried south by the Oyashio. The waters of the Gulf of Alaska are relatively warm through the year. These differences may be expected to have direct effects on the growth and behavior of the salmon and indirectly through their effects on the nature and abundance of food organisms.

KING CRAB

The United States has increased its research effort on king crabs in the eastern Bering Sea, continuing the research program begun with Japan over a year ago. While in the area, biologists of the two countries communicated almost daily by radio-

phone to exchange ideas. Mr. Seiwa Kawasaki of the Japan Fishery Agency was aboard the U. S. Fish and Wildlife Service charter vessel *Tordenskjold,* for a total of ten days; Mr. T. Miyahara of the Fish and Wildlife Service made three brief visits aboard the *Tokei Maru,* the Japanese king crab mothership.

Records of the Commercial Catch.

Although the United States was unable to place biologists aboard commercial fishing boats in 1955, operators of the *Deep Sea* and *Nordic Maid,* fishing in the Bering Sea area, have made their log books available to the Service These log books provide records as to time, duration, course, depth and position for each trawl effort as well as wind direction and force, barometric pressures and total number of legal† size male king crabs. Some information on other species is also noted.

Catch data from the Japanese mothership operations have also been received. The data include dates, position of the mothership, number of trawl efforts, number of tangle net units lifted, catch of legal sized male crabs by gear, and sometimes the number of cases of cannned crabs produced.

An examination of the available log books of the *MV Deep Sea* and the catch data from the Japanese fishery has been made. The log book records of the *Deep Sea* date back to 1950. The catch data of the Japanese efforts are available for 1931 and from 1933 through 1939, and also from 1953 through 1955. Because of some discrepancies in some of the Japanese pre-war data, the analysis was confined to only the post-war activities.‡

The data from these sources show that, based on the catch-per-unit-effort values for the *Deep Sea,* the relative abundance of king crabs in the eastern Bering Sea was about the same in 1951 as in 1950, about twenty percent less in 1952, about ten percent less in 1953, about five percent less in 1954, and in 1955, about ten percent greater than

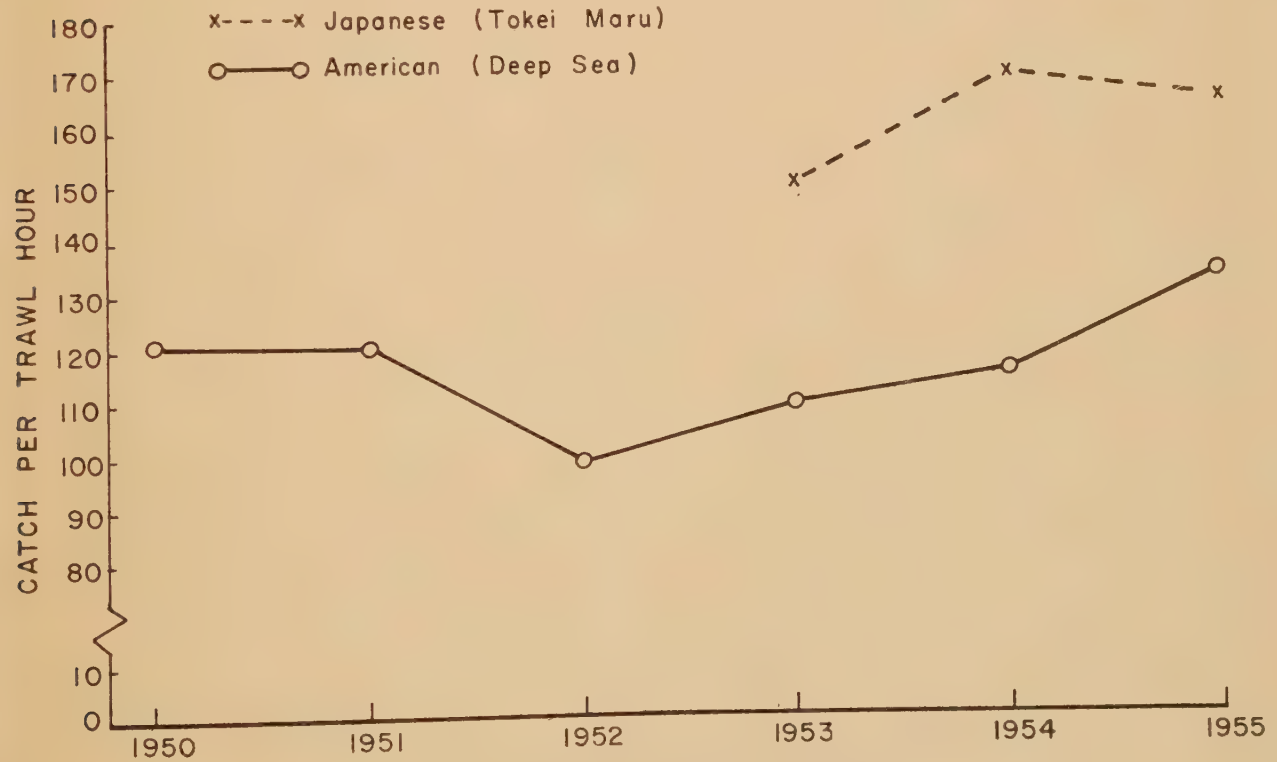


Fig. 4. King Crab Catch-per-Effort — 1950 - 1955.

† King crabs measuring more than 6½" in greatest width of carapace.
‡ Details of the pre-war data have been requested from Japanese sources.

in 1950 and 1951 (see Fig. 4). Although the catch-per-unit-effort value for 1955 may not be comparable, due to an alteration of the *Deep Sea's* net, the Japanese catch-per-unit-effort value for 1955 remains at a high level. These values indicate that the abundance of king crabs in the eastern Bering Sea does not show signs of decline.

Distribution.

From May 10 to July 27, 1955, the vessel *Tordenskjold,* investigated the distribution and abundance of king crabs independent of the commercial fishing operations. As shown in Fig. 5, there were twenty-six trap and trawl stations distributed throughout the fishing area.

Traps were not satisfactory for these studies; they selectively took male crabs, were difficult to locate in the high seas and, because of the strong tides and winds, often drifted away from their stations and were lost.

Trawling proved to be the more effective method of fishing, and a total of 104 trawl efforts were made, each of one-half hour duration, and distributed over the twenty-six stations. Of great interest is that crabs were found throughout the areas explored as evidenced by the catch of king crabs in every one of the 104 trawl efforts. Indications of abundance during the period of June and July of 1955, were found only in two well separated areas.

Relation of Currents to Distribution of Young Crabs.

At each of the twenty-six fishing stations we obtained surface and bottom water temperatures, as well as a water sample from the bottom for analysis by the Department of Oceanography of the University of Washington. Although we made numerous plankton hauls in the commercial fishing area between March 13 and June 1, 1954 and between July 13 and December 2, 1954, no larval king crabs were observed. This suggests that the young inhabit areas other than those occupied by the commercial fleet.

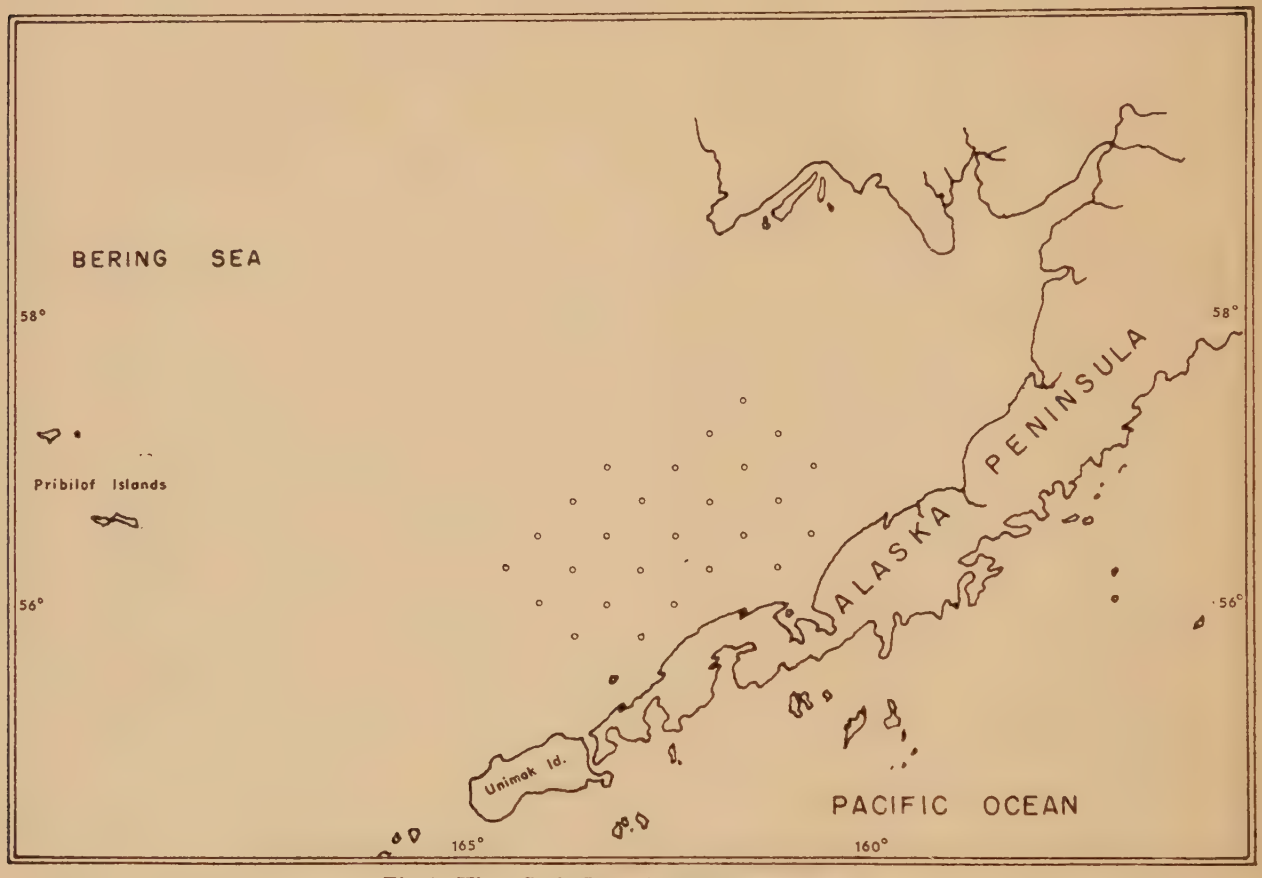


Fig. 5. King Crab Sampling Stations — 1955.

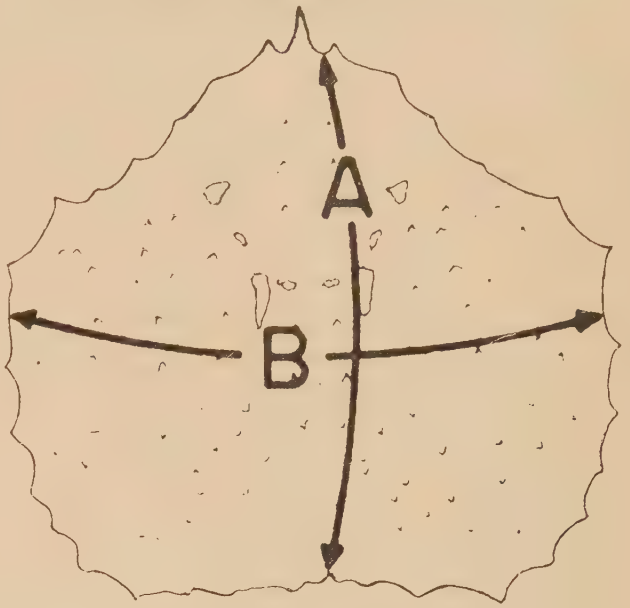
Identification of Stocks.

The standardized measurements agreed upon by biologists of Japan and the United States in March of 1954 are shown in Figure 6. The United States has now measured a total of 8,466 king crabs (Table 13) and is coding the data on punched cards in preparation for statistical study and analysis.

TABLE 13. King Crab Measurements.

Year	Vessel	Number Measured
1953	Tokei Maru	3,840
1954	Deep Sea	2,712
1955	Tordenskjold	1,914
Total		8,466

Fig. 6. Diagram showing Standardized King Crab Carapace Dimensions.



Distance A: Carapace length measured from the hind margin of the right orbit to the mid point of the posterior margin.

Distance B: Carapace width is the greatest distance across the carapace. This measurement is made between spines.

Growth and Age Determination.

Evidence from two independent experiments indicates that mature male king crabs may not molt regularly every year as previously believed. First, observations made on crabs brought from

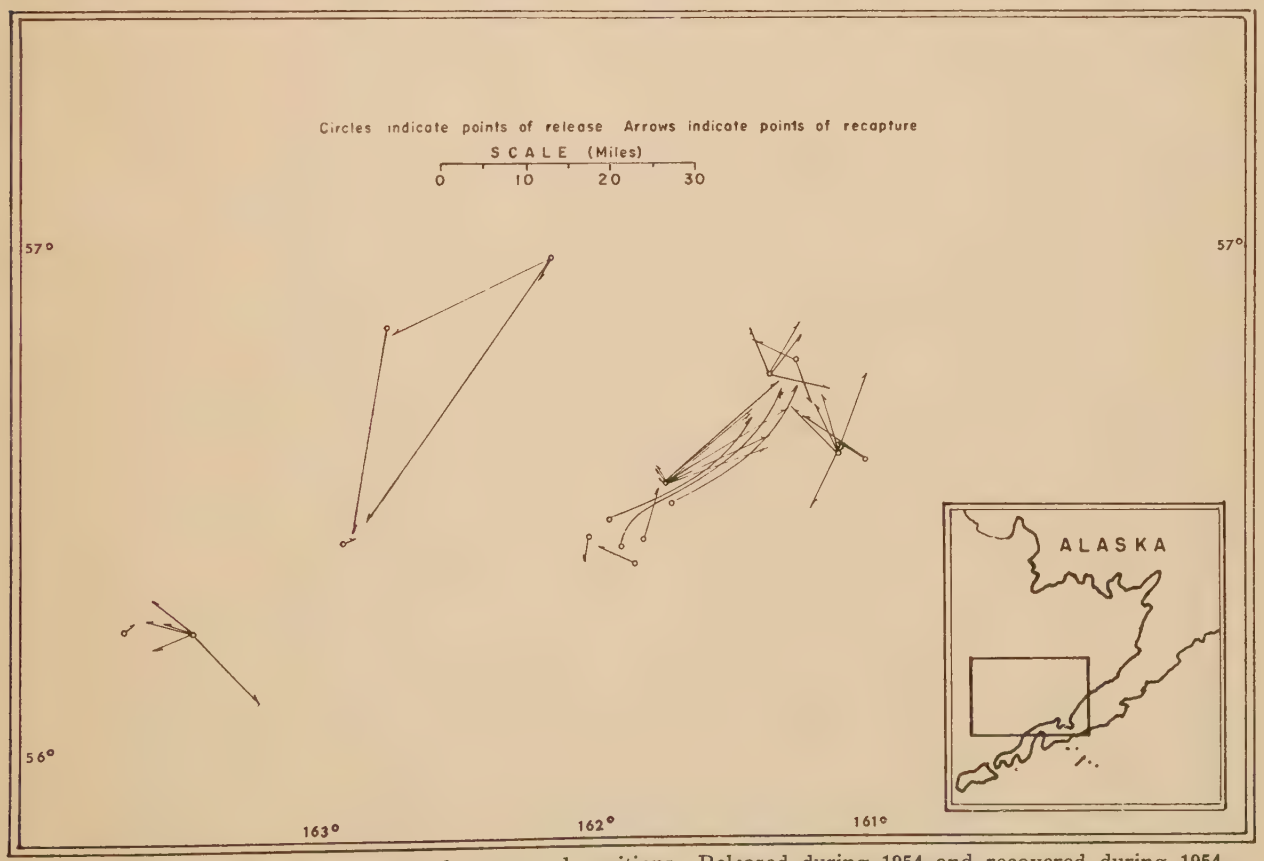


Fig. 7. Tagged King Crab released - recovered positions. Released during 1954 and recovered during 1954.

the Bering Sea to the laboratories at Friday Harbor and Bowman's Bay, Washington showed that some of the male crabs held in captivity failed to molt. Second, plastic discs were attached to the carapace of male king crabs at sea to determine seasonal movement during 1954. Of these tags, 61 have been returned in 1955 of which 28 had been retained on the crabs for more than a year after release.

Study of Movements of Crabs by Tagging.

United States biologists conducted tagging experiments in 1954 from the *Deep Sea,* and again in 1955 from the chartered vessel *Tordenskjold* In 1954 they attached "Peterson disc" tags either to the carapace or to the legs by means of nickel pins. Although the tags were lost at the time of molting, this experiment yielded valuable within-season information. Of the 1,108 tagged crabs released in 1954, we have recaptured 104, 44 of them during 1954 and 60 during the 1955 fishing season. The general areas of release and recoveries during 1954 are illustrated in Fig. 7. Fig. 8 illustrates recoveries in 1955 from 1954 releases.

Realizing the deficiencies of a tag that is lost during molting, we adopted a different type of tag in 1955. Biologists placed a "spaghetti tag" made of plastic tubing, through the muscle tissue under the carapace and tied it securely to form a loop (Fig. 9). This type of tag, previously used by the Alaska Department of Fisheries and by the Japanese, should be retained by the crab through molt. We tagged a total of 1,350 male king crabs in this manner during 1955, distributed throughout the 26 fishing stations. The recoveries during the 1955 fishing season totaled 32 crabs. (See Fig. 10 for positions of tagged crab releases and recoveries).

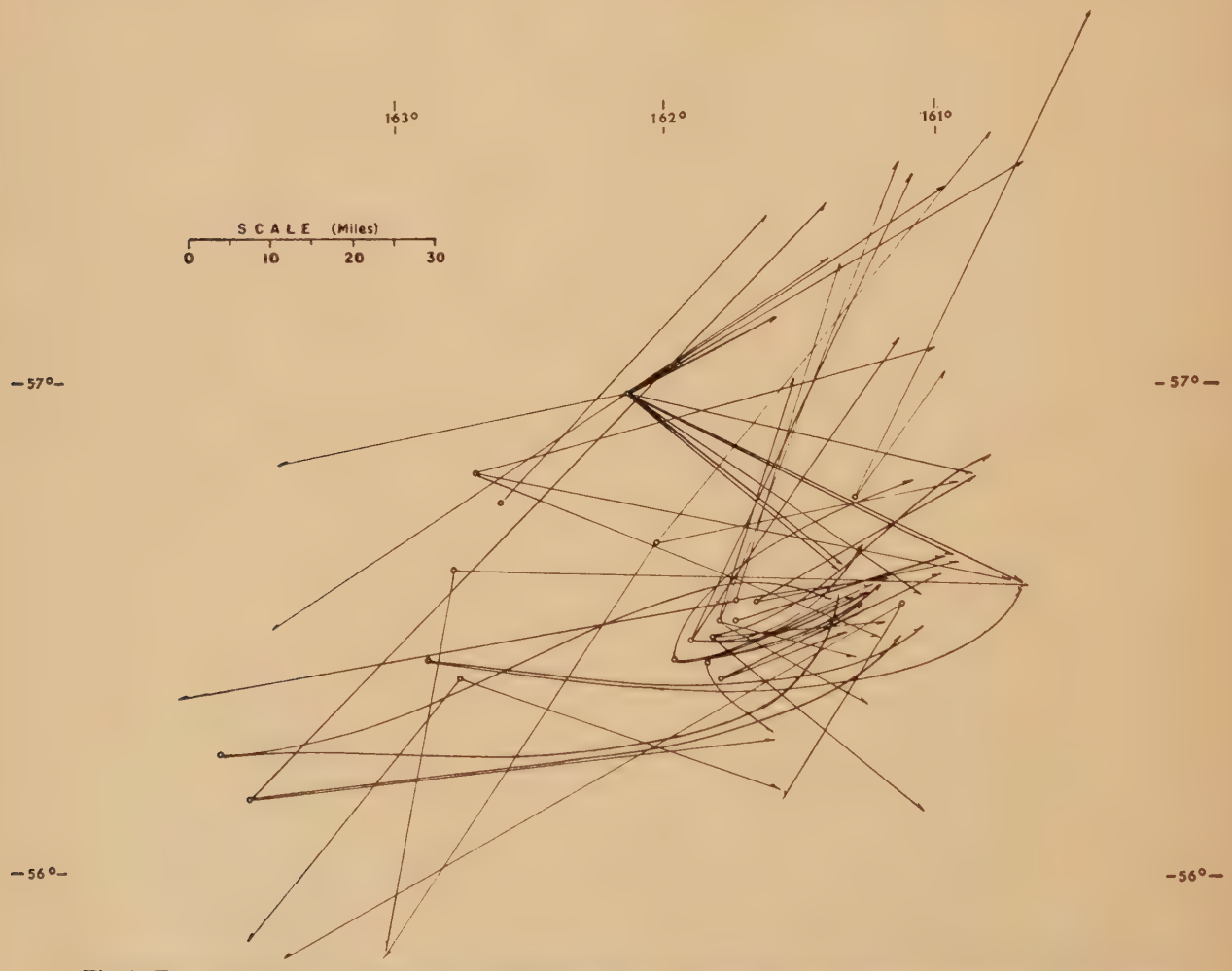


Fig. 8. Tagged King Crab released - recovered positions. Released during 1954 — Recovered during 1955.
Circles indicate points of release. Arrows indicate points of recapture.

Figure 9. ILLUSTRATION OF A KING CRAB WITH "SPAGHETTI" TYPE TAG

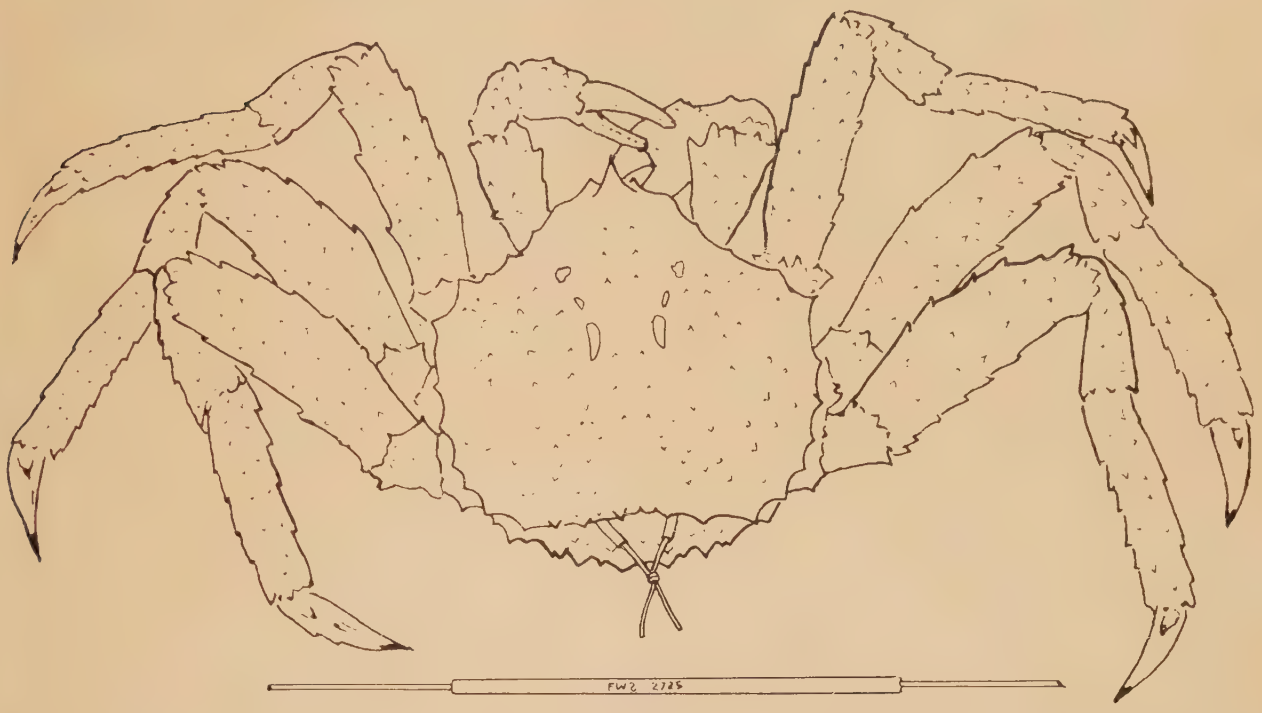
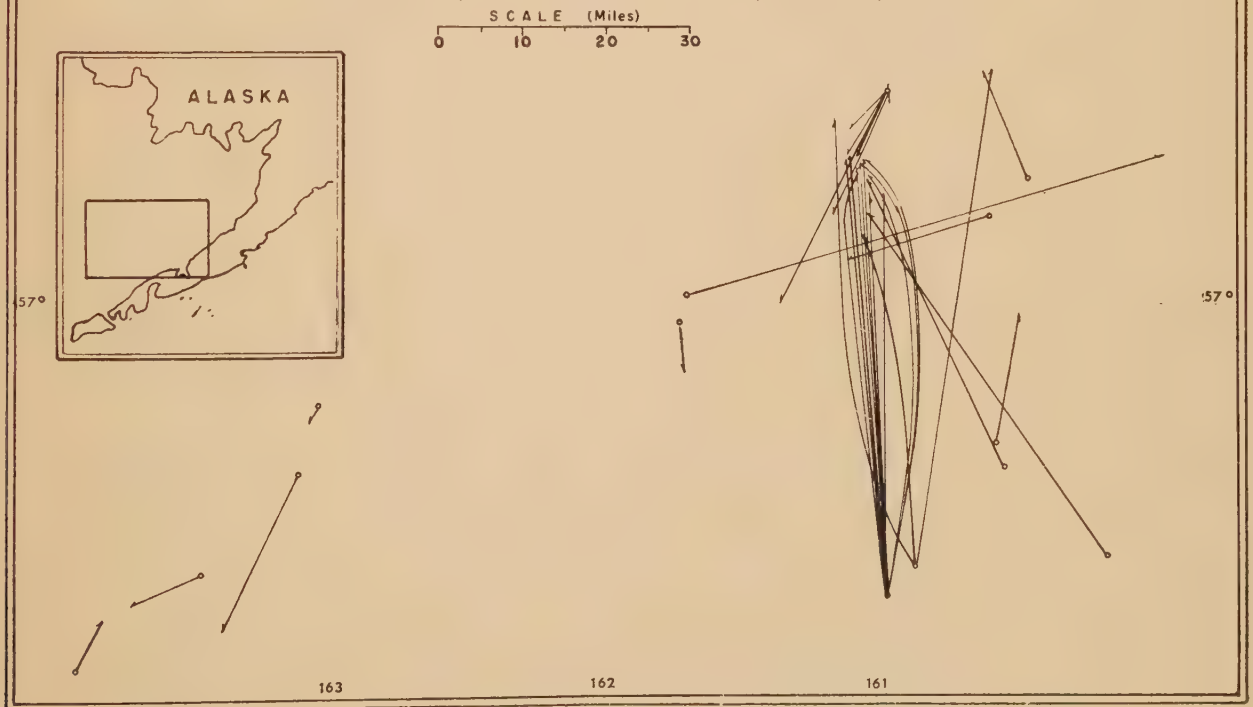


Figure 10. TAGGED KING CRAB RELEASED – RECOVERED POSITIONS

RELEASED DURING 1955 – RECOVERED DURING 1955

Circles indicate points of release Arrows indicate points of recapture



Determination of Mortalities.

Because the king crab fishery uses only the adult male crabs, releasing all others, we obtained information aboard the trawler *Deep Sea,* in 1954 on the mortality of the released crabs. A summary of these observations is given in Table 14. In 39 observations during the spring trip and 53 made during the fall, the greatest mortality of both sexes occurred when the crabs were in a soft-shell condition.

TABLE 14. Observations on the Mortality of King Crabs Released from a Trawl Fishery.

Sex	Condition	Time: Spring Mar. 3 - May 22, 1954	Time: Fall July 22 - Aug. 16, 1954	Total
Number of Observations:		39	53	92
Females:	Mature—			
	Total caught	17,976	1,158	19,134
	Total killed	225	93	318
	Percent killed	1.25	8.03	1.66
	Immature—			
	Total caught	15	2	17
	Total killed	0	0	0
	Percent killed	0	0	0
	Soft—			
	Total caught	9	5	14
	Total killed	4	4	8
	Percent killed	44.44	80.00	57.14
Males:	Mature—			
	Total caught	8,334	13,205	21,539
	Undersized—			
	Total caught	892	6,245	7,137
	Total killed	5	104	109
	Percent killed	0.56	1.67	1.53
	Soft—			
	Total caught	597	118	715
	Total killed	192	36	228
	Percent killed	32.16	30.51	31.89

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